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NAVAL POSTGRADUATE SCHOOL

Monterey, California



THESIS

**IMPLEMENTATION OF ELECTRONIC COMMERCE IN
THE DEPARTMENT OF DEFENSE AND THE NATIONAL
AERONAUTICS AND SPACE ADMINISTRATION**

by

Rodney A. Gray

December 1996

Principal Advisor:

Janice Menker

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**IMPLEMENTATION OF ELECTRONIC COMMERCE IN THE DEPARTMENT
OF DEFENSE AND THE NATIONAL AERONAUTICS AND SPACE
ADMINISTRATION**

Rodney A. Gray
Lieutenant, United States Navy
B.A., University of Washington, 1987

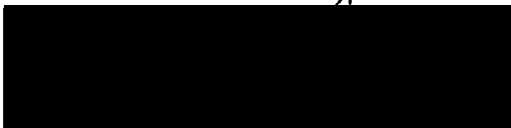
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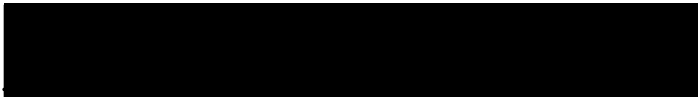
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**NAVAL POSTGRADUATE SCHOOL
December 1996**


Author:


Rodney A. Gray

Approved by:


Janice Menker, Principal Advisor


Mark Stone, Associate Advisor


Reuben T. Harris, Chairman
Department of Systems Management

ABSTRACT

President Clinton's Executive Memorandum of 26 October 1993 mandated that all Federal Government agencies implement Electronic Commerce (EC) in order to "simplify and streamline the purchasing process."

Two agencies, the Department of Defense (DoD) and the National Aeronautics and Space Administration (NASA) employed divergent strategies and policies in implementing the President's Memorandum. The DoD pursued a strategy using an existing DoD Electronic Commerce/Electronic Data Interchange (EC/EDI) architecture. The NASA employed an Internet-based tool, the NASA Acquisition Internet Service (NAIS), as the cornerstone of its EC program.

This thesis examines the unique approach each agency employed, analyzing organizational theory and other influential factors to explain why two Federal agencies chose to implement such different strategies.

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I. INTRODUCTION

A. BACKGROUND

Today's Department of Defense (DoD) acquisition professional operates in a dynamic and volatile environment, unlike that of the acquisition environment only one decade ago. Declining procurement dollars are a key contributor. "The Clinton Administration just-released 1997 defense authorization budget of \$242.6 billion, for instance, continues a decade-long slump that has seen procurement spending drop by more than 70 percent." (Ref. 1, p. 583) Additionally, the information age is upon us.

...Each day we face new technological realities that we could only imagine yesterday: a national information infrastructure, the information superhighway with on-ramps and off-ramps in every home, and more. Each day it seems we must change our behavior and adapt to such new information-dominated technologies as automatic teller machines, debit cards, the Internet, and interactive television. In moving to the information age, humankind is putting itself through a technological revolution reminiscent of shifts from hunting and gathering to agriculture and from an agrarian economy to a manufacturing one. (Ref. 2, p. vi)

It is also critical to understand several other recent events to fully comprehend the historical context in which electronic commerce has evolved and this thesis is written.

- The Clinton Administration's Bottom-Up-Review
- The National Performance Review
- President Clinton's Electronic Commerce Memorandum
- DoD Electronic Commerce in Contracting Process Action Team Report and Federal Electronic Commerce Acquisition Team Report
- Emergence of information technology, specifically the Internet

First, when the Soviet Union fell and the Cold War ended, the U.S. quickly changed its focus from fighting one superpower to addressing numerous threats emerging

throughout the world, in nations such as Iraq, Somalia, Rwanda, Macedonia, Haiti, and Bosnia. (Ref. 1, p. 582) In 1993, the Clinton Administration called for a Bottom-Up-Review (BUR) to devise a plan for the post-Cold War military and “shift more rapidly from its Cold War “comfort zone of big wars and nuclear deterrence into a world of new threats, dramatically lower budgets and quickly changing technologies.” (Ref 1, p. 582)

The BUR called for more significant reductions than President Bush’s Administration’s plan, cutting 200,000 more troops and \$104 billion in defense budget authority from 1995-1999. (Ref. 1, p. 584) In order to meet these constraints, the Secretary of Defense, William J. Perry, stated the DoD had to be “successful in harvesting savings from the Base Realignment and Closure process (BRAC) and realize savings from acquisition reform. (Ref 1, p. 584)

Second, in March of 1993, President William J. Clinton initiated another effort titled the National Performance Review (NPR), appointing Vice President Al Gore the leader of this effort. (Ref. 3) The Administration launched the NPR initiative while addressing the Federal deficit with what they called the “largest deficit reduction package in history.” (Ref 4, p. i) While the BUR primarily affected only the DoD, the NPR aimed to improve the entire Federal Government’s internal business processes and practices. “The National Performance Review is the Clinton-Gore Administration’s initiative to reform the way the Federal Government works. Its goal is to create a government that works better and costs less.” (Ref. 1, p. i) The original NPR team consisted of approximately 250 career civil servants, interns, state and local government employees, as well as some consultants. (Ref. 3) The President directed agencies to form internal re-invention teams who worked with corresponding NPR teams, examining business

processes and making recommendations to improve governmental operations. (Ref 3)

After an intensive six-month review, the NPR team presented President Clinton with 384 recommendations on how to improve the Government. One specific recommendation was establishing a "government-wide electronic commerce (EC) capability". (Ref 4, p. 164)

Third, on October 26, 1993, President Clinton issued a memorandum for the heads of Executive Departments and Agencies, entitled "Streamlining Procurement through Electronic Commerce." (Ref 5, p. 1) Electronic commerce, as stated in the memorandum, encompassed a wide variety of technologies, among others, Electronic Data Interchange (EDI), Electronic Bulletin Boards (EBB), Electronic Mail (E-Mail), and Electronic Funds Transfer (EFT). (Ref 2, p. 1-2) The President stressed that "moving to an Electronic Commerce (EC) system would streamline acquisition, and improve customer service and cost effectiveness." (Ref 5, p. 1) The memorandum presented an aggressive schedule for implementing the electronic commerce initiative by January 1997.

Fourth, the President's Memorandum, among several objectives, directed his President's Management Council (PMC) to establish a task force to implement EC within the Federal Government. (Ref. 2, p. x) This task force was chaired by the Administrator, Office of Federal Procurement Policy (OFPP) with membership from all major Federal departments and agencies. On 3 January 1994, the OFPP chartered a Federal Electronic Commerce Acquisition Team (ECAT) and directed it to develop a plan for implementing EC within 120 days. (Ref. 2, p. x) The Federal ECAT issued their initial report in April 1994 and their final report on 13 October 1994.

Before OFPP chartered the Federal ECAT, DoD was completing an initiative directed by Deputy Under Secretary of Defense (Acquisition Reform), Ms. Colleen

Preston. On 22 July 1993, Ms. Preston had formed a DoD Electronic Commerce in Contracting Process Action Team (DoD ECIC PAT) to “immediately assess the Department’s current EC capability in contracting and to develop a comprehensive plan for the implementation of Electronic Data Interchange (EDI).” (Ref 2, p. 3) On 20 December 1993, the PAT issued its report to the Under Secretary of Defense (Acquisition and Technology), Mr. John Deutch, who approved the report and directed the implementation of the PAT report’s recommendations on 5 January 1994. (Ref. 6, p. 1)

Fifth, information technologies such as the Internet began to alter business practices within the private sector in the early 1990’s. (Ref. 7) The Internet had existed since 1969 as a Defense Department research project and then as the National Science Foundation Network (NSFNET) in 1986. (Ref. 8, p. 167) In 1991, Vice President Gore, then a U.S. Senator, proposed widening the architecture of NSFNET to include more primary and secondary schools, community colleges, and universities. (Ref. 8, p. 167) The resulting legislation expanded NSFNET, renamed it National Research and Educational Network (NREN), and allowed businesses to purchase part of the network for commercial use. (Ref 8, p. 167) However, it was not until 1993, that World Wide Web technology matured and businesses and the media began taking notice of the Internet’s capabilities. (Ref. 7)

Federal agencies are implementing EC, which has evolved within this historical context. The governing document providing guidance to agencies is the President’s October 1993 Executive Memorandum. Two Federal agencies, the Department of Defense (DoD) and the National Aeronautics and Space Administration (NASA) adopted unique approaches to implement the President’s Memorandum.

The DoD focused its efforts to implement EC utilizing its existing EC capabilities. (Ref. 9, p. 19) The PAT demonstrated that many DoD activities were already using EC technology. Using those initiatives supported DoD's near-term efforts and provided a foundation for future electronic commerce systems. (Ref. 9, p. 16) NASA, conversely, pursued an alternate strategy to establish an electronic commerce capability. (Ref. 10, p. 22) After conducting its own review of electronic transmission applications, NASA procurement officials decided to investigate an alternative solution, the Internet.

This thesis examines the implementation of the President's memorandum within DoD and NASA, exploring the development of policies and using organizational theory to describe each organization and its unique philosophies in implementing EC strategy and policy.

B. OBJECTIVE

This paper will present an approach for understanding how the Department of Defense and NASA implemented electronic commerce, using organization theory as the analytical framework for discussion. By using organization theory to compare and explain the implementation of electronic commerce within each organization, the reader can better comprehend the many internal and external factors influencing the implementation of any policy within his or her organization. This study is not an implementation guide for establishing an EC capability within an organization and should not be read as such. However, the theoretical approach provides a framework for establishing future policy.

C. RESEARCH QUESTIONS

Primary Research Question: What aspects of organizational theory and other influential factors can explain the different paths of implementation used by the DoD and NASA in complying with the Presidential Memorandum on electronic commerce, and how can such an analysis assist the acquisition professional in implementing policy within his or her organization?

Subsidiary Questions:

1. What was the original intent of President Clinton's Electronic Commerce Memorandum, and how has electronic commerce policy evolved since the Presidential Memorandum was issued?
2. How have DoD and NASA implemented their respective network architectures to satisfy the President's EC Memorandum?
3. How does the use of organizational theory describe the organizational configurations of DoD and NASA?
4. What were the influential factors and documents that guided the policy and implementation for the decision makers of each agency?
5. What is the effect of new technology, such as the Internet, on an organization as it seeks to implement a Presidential memorandum?

D. SCOPE OF THESIS

The main thrust of the thesis is a case study describing electronic commerce implementation by two agencies within the Executive Branch, DoD and NASA. By using organizational theory as the framework for discussion, the paper explores the unique approaches each organization employed and the affect of organizational configuration on the implementation of policy within each organization. This thesis does not require the use of classified materials and may be categorized as unclassified in nature.

E. LIMITATIONS AND ASSUMPTIONS

1. Limitations

This thesis is limited to a discussion of the implementation of electronic commerce in DoD and NASA from a strategic perspective. This paper does not provide in-depth technical discussion of the network architecture configurations, hardware, software, and programming necessary for both the Federal Acquisition Computer Network (FACNET) and the NASA Acquisition Internet Service (NAIS). This paper provides only a broad overview of key concepts in EC and the Internet. Although EC includes numerous technologies, this study primarily focuses upon the EDI capability within the Federal Government and DoD.

Additionally, the analysis of each organization will be accomplished, using one primary organizational theory. Although numerous approaches to analyzing organizational behavior and configuration are well documented, the researcher chose to use Henry Mintzberg's organizational theoretical framework for analysis.

2. Assumptions

While the thesis provides a thorough list of key terms and definitions within its appendices, the researcher assumes the reader possesses a sufficient background knowledge of acquisition procedures and terms, as well as the Federal Acquisition Regulation. Even though Chapters IV, V, and VI provide sufficient background of EC implementation in the Government, the reader should already understand the basic tenets of the EC/EDI implementation within DoD and the Federal Government. While the researcher does not expect the reader to be fully acquainted with the NASA organizational

structure, the reader is expected to have a basic knowledge of organizational structures within the Executive Branch and the Department of Defense.

F. ORGANIZATION OF STUDY

This thesis is organized in order to analyze two separate cases, using the “grounded theory approach”. In order to accomplish this method of analyses, the study is organized in a specific format.

Chapter II describes the research methodology and the reasons for choosing the particular research technique used for this thesis.

Chapter III introduces the organizational theory and model, which will be employed in analyzing both DoD and NASA. The model and theories will then be applied to the specific cases discussed in Chapters VI and VII.

Chapter IV provides the reader an overview of the concept of EC, its history and use in industry and Government, and a discussion of the Internet.

Chapter V provides a chronology of EC policy within the Federal Government.

Chapter VI discusses EC implementation within DoD, including historical perspective, evolution of EC, and policy issues.

Chapter VII discusses EC implementation within NASA, including historical perspective, evolution of EC, and policy issues.

Chapter VIII provides analysis, using the theoretical framework from Chapter III to explore organizational theory to explain DoD’s and NASA’s unique approach in implementing the Presidential Memorandum. This chapter will also explore other influential factors to explain the agencies’ unique paths of implementation.

Chapter IX is comprised of Conclusions and Recommendations.

G. ABBREVIATIONS

A list of acronyms used within this thesis is presented in an appendix.

II. RESEARCH METHODOLOGY

A. INTRODUCTION

1. Type of Research Methodology

The choice of a research technique is predicated upon three principal conditions:

- the type of research question
- the control an investigator has over actual behavioral events
- the degree of focus on contemporary as opposed to historical events

(Ref. 11, p. 13)

Many methodologies are available to researchers. Some examples are experiments, surveys, histories, analysis of archival information, and case studies. (Ref. 11, p. 13)

This researcher chose to use the case study as the methodology for this thesis. A case study “tries to illuminate a decision or set of decisions; why they were taken, how they were implemented, and with what result.” (Ref 11, p. 23) A case study is defined as an empirical inquiry that:

- investigates a contemporary phenomenon within its real-life context; when
- the boundaries between phenomenon and context are not clearly evident and in which
- multiple sources of evidence are used (Ref. 11, p. 23)

Referring back to initial conditions in choosing a research methodology, the case study is the preferred methodology when “a how or why question is being asked about a contemporary set of events over which the investigator has little or no control.” (Ref. 11, p. 20)

The case study method was chosen because the conditions best fit the type of research necessary to answer the research question.

- The research question essentially asks why two organizations, DoD and NASA choose the approach they did to implement President Clinton's Memorandum
- While the cases are described in a historical context, the question asked regards a contemporary event, implementation of electronic commerce (EC) within the Federal Government
- The researcher does not have control over these behavior events within the two organizations

Since the researcher focuses upon both historical and contemporary events, this is not a pure case study as defined above, but for the purpose of defining a research methodology, the case study best defines the research technique employed for this thesis.

2. Components of Research Methodology

The researcher used a multi-faceted approach in conducting research for the thesis.

The components of the research used are as follows:

- literature review
- telephone and personal interviews
- establishing a theoretical framework using organizational theory

B. DETERMINING RESEARCH QUESTION

Initially, the researcher set out to investigate the potential of the Internet as an electronic commerce tool. The researcher then performed a general review of available literature to identify and further define a research question. Through the review of electronic databases of contemporary articles, World Wide Web sites, and a cursory review of governmental electronic commerce regulations, the researcher discovered that NASA used the Internet to conduct electronic commerce. Understanding that DoD had

focused its current efforts in further developing its electronic commerce/electronic data interchange (EC/EDI) infrastructure, the researcher chose to investigate why two Federal agencies had chosen to pursue such diverse approaches to implement electronic commerce.

C. LITERATURE REVIEW

The researcher performed an extensive literature search in order to understand the complex historical context in which EC has evolved. The literature review consisted of reading the Federal Acquisition Streamlining Act (FASA), Federal Acquisition Regulation (FAR), and applicable Federal and DoD EC Process Action Team (PAT) Reports. Furthermore, literature review required understanding the importance of the National Performance Review and a Presidential Executive Memorandum on EC issued in October 1993. In addition, the researcher perused theses, periodicals, and Internet resources in order to further comprehend the evolution of EC and the Internet within both the private and public sectors. From the literature review, the researcher developed a timeline by which the evolution of the Internet, EC in the Federal Government, and EC in DoD and NASA were compared.

D. TELEPHONE AND PERSONAL INTERVIEWS

Utilizing knowledge gained from the literature review, the researcher conducted numerous telephone conversations and personal interviews with key Federal Government, DoD, and NASA professionals. The personal interviews were necessary to explore and understand real time issues regarding implementation of EC policy in Federal agencies. The researcher interviewed procurement officials within the Navy and the DoD EC/EDI Office in order to understand the history of EC in DoD, DoD's current EC efforts, and the

challenges in implementing the DoD EC/EDI infrastructure. Procurement officials at NASA officials were interviewed to discuss their efforts in using the Internet to conduct EC using the NASA Acquisition Internet Service (NAIS). Finally, the researcher interviewed key personnel from the Federal Electronic Commerce Acquisition Program Management Office, Office of Federal Procurement Policy (OFPP), and the General Accounting Office (GAO) to gain a broader perspective on EC implementation in the Federal Government and OFPP EC policy.

E. THEORETICAL FRAMEWORK

The researcher decided to use organizational theory to provide the principal theoretical framework by which to analyze the organizational behavior of DoD and NASA in implementing EC within their respective organizations. In order to use organizational theory to fulfill this purpose, the researcher first developed an understanding of the basic tenets of organizational theory and organizational theory's strengths and weaknesses as a method to analyze the actions, behaviors, and configurations of organizations.

Organizational theories abound, each providing an explanation or model to help in understanding the tendencies and patterns that organizations exhibit. The researcher chose to use the theoretical models of Henry Mintzberg. Mintzberg categorizes organizations based upon organizational configurations. Two of those configurations demonstrated characteristics similar to those of DoD and NASA. Thus, the models provided a strong basis by which to analyze the decisions and actions of each agency. Chapter III discusses organizational theory and provides a detailed description of two organizational configurations.

While organizational theory provides a theoretical framework by which to analyze DoD's and NASA's EC paths of implementation, it does not necessarily provide the only explanation for each agency implementing EC differently. This thesis will analyze other influential factors in addition to organization theory.

III. ORGANIZATION THEORY

A. INTRODUCTION

The term “organization” is defined by Webster’s Dictionary as “a body of persons organized for some end or work.” (Ref 12, p. 1014) Some alternate definitions of “organization” provided by organizational theorists are as follows:

- A phenomenon that occurs when individuals come together as a group to achieve a common objective...Human beings working individually and in groups toward a goal in a system that has identifiable boundaries. (Michael L. Vasu, Debra W. Stewart, G. David Garson)
- A system of consciously coordinated activities or forces of two or more persons. (Chester Barnard)
- Patterned activities of a number of individuals. Moreover, these patterned activities are complementary or interdependent with respect to some common output or outcome; they are repeated, relatively enduring, and bounded by space and time. (Daniel Katz, Robert L. Kahn)
- The structure of authoritative and habitual personal interactions in an administrative system. (Dwight Waldo) (Ref. 13, p. 3)

This thesis examines DoD and NASA, two organizations described as “public organizations”. Public organizations are described as follows:

...created by law and supported by taxes. They are both staffed by people who approach work through written rules and procedures that facilitate the division of labor. They also both have methods for employing people based on merit and hierarchy. (Ref. 13, p. 3).

Organizational theory is the “approach that seeks to describe, compare, and evaluate organizations...it is a field of study that seeks to provide a theoretical framework for understanding and predicting organizational outcomes.” (Ref. 13, pp. 3,4)

Organizational theory provides significant insights into organizations. First, organizations have a paradoxical nature. (Ref. 13, p. 4) On one hand, organizations must differentiate

work into separate tasks or parts to operate efficiently, economically converting inputs to outputs. On the other hand, organizations must integrate specialized parts together into a coherent whole to achieve maximum effectiveness and goals that may go beyond efficient use of resources. (Ref 13, p. 4) Second, organizations “can and do exhibit a ‘culture’, a set of assumptions, values, and perceptions about how ‘to get things done’”. Finally, the organization is the sum of its parts and, at times, greater than the sum of its parts.”

(Ref. 13, p. 4)

This chapter focuses on concepts of organizational theory described by Henry Mintzberg, who teaches policy in the Faculty of Management at McGill University in Montreal, Canada. (Ref. 14, p. 2) Dr. Mintzberg theorizes six separate categories by which to describe organizations. The categories or “organizational configurations”, as defined by Mintzberg, are as follows:

- The Simple Structure
- The Machine Organization
- The Professional Bureaucracy
- The Innovative Organization
- The Divisionalized Form
- The Missionary (Ref. 14, p. vii)

This chapter discusses only the Machine Bureaucracy and the Innovative Organization models, which will be used to describe and analyze the DoD and NASA organizations and each of those agency’s distinctive paths to implement President Clinton’s Executive Memorandum on Electronic Commerce. The researcher chose to investigate only the

Machine and Innovative Organizations because those two configurations best fit the two agencies, DoD and NASA.

B. KEY DEFINITIONS

It is helpful to define several key terms prior to discussing Mintzberg's organizational contexts. The key definitions are provided as follows:

- Theory - Coherent set of interrelated definitions or propositions, presenting a systematic view of an event or phenomenon with the objective of explaining and predicting that event or phenomenon. (Ref. 13, p. 4)
- Strategy - Pattern or plan that integrates an organization's major goals, policies, and actions sequences into a cohesive whole. A well-formulated strategy helps to marshal and allocate an organization's resources into a unique and viable posture based on its relative internal competencies and shortcomings. (Ref. 14, p. 3)
- Policy - Rules or guidelines that express the limits within which action should occur. These rules often take the form of contingent decisions for resolving conflicts among specific objectives. Like the objectives they support, policies exist in a hierarchy throughout the organization. Major policies - those that guide the entity's overall direction and posture or determine its viability - are called strategic policies. (Ref. 14, p. 3)

C. KEY FACTORS OF MINTZBERG'S THEORETICAL FRAMEWORK

1. Six Basic Parts of the Organization

Different parts of the organization play specific roles in accomplishing work and coordinating within the organization. Mintzberg's framework introduces six basic parts of the organization. (Ref. 14, p. 278)

- Operating Core - Where the basic work of producing the organization's products and services gets done, where the worker's assemble automobiles and the surgeons remove appendices.
- Strategic Apex - Home of top management, where the organization is managed from a general perspective

- Middle Line - Comprises all those managers who stand in direct line relationship between the strategic apex and the operating core.
- Technostructure - Includes the staff analysts who design the systems by which work processes and outputs of others in the organization are formally designed and controlled.
- Support Staff - Comprises all those specialists who provide support to the organization outside of its operating workflow - in the typical manufacturing firm, everything from the cafeteria staff and the mailroom to the public relations department and the legal counsel.
- Ideology - forms the sixth part, a kind of halo of beliefs and traditions that surrounds the whole organization. (Ref. 14, p. 278)

2. Six Basic Coordinating Mechanisms

Six mechanisms of coordination describe the fundamental methods that organizations use to coordinate their work. (Ref. 14, p. 278)

- Mutual Adjustment - Coordinating work with informal communications. Mutual adjustment is used in the simplest of organizations and also in complex organizations because it is the only means that can be relied upon under extremely difficult circumstances, such as trying to put a man on the moon.
- Direct Supervision - One person gives orders to others
- Standardization of Work Processes - The specification - that is, the programming - of the content of the work directly, the procedures to be followed.
- Standardization of Outputs - Specification is provided to achieve specific results. The interfaces between jobs are predetermined, such as an assembly line.
- Standardization of Skills - The worker, rather than the work, is being standardized
- Standardization of Norms - Workers share a common set of beliefs and can achieve coordination based on it. (Ref 14, p. 280)

The coordinating mechanisms provide cohesion for all the divided labor of the organization. (Ref 14, p. 280)

3. Situational Factors

The Mintzberg framework also describes what he calls "situational factors."

(Ref.49, p. 293) These situational factors can influence decisions made within the organization. The factors are: age and size; technical system; environment; and power. Descriptions of the factors along with hypotheses associated with each factor are provided as follows:

- Age and Size

Hypothesis 1: The older the organization, the more formalized its behavior.
Organizations tend to repeat their behavior.

Hypothesis 2: The larger the organization, the more formalized its behavior.

Hypothesis 3: The larger the organization, the more elaborate its structure; that is, the more specialized its tasks, the more differentiated its units, and the more developed its administrative components

- Technical System - Instruments used in the operating core to produce the outputs.

Hypothesis 1: The more regulating the technical system, the more formalized the operating work and the more bureaucratic the structure of the operating core.

Hypothesis 2: The more complex the technical system, the more elaborate the administrative structure.

- Environment - General Conditions that surround an organization.

Hypothesis 1: The more complex the environment, the more decentralized the structure.

Hypothesis 2: The more diversified the organization's markets, the greater the propensity to split it into market-based units, or divisions.

Hypothesis 3: Extreme hostility in its environment drives any organization to centralize its structure temporarily. The tendency for groups is to centralize power, falling back on tight mechanisms like direct supervision. Here a central leader can ensure fast and highly coordinated response to the threat.

- Power

Hypothesis 1: The greater the external control of the organization, the more centralized and formalized its structure.

Hypothesis 2: The power needs of the members tend to generate structures that are excessively centralized. (Ref. 14, p. 293-296)

D. THE MACHINE ORGANIZATION

The machine bureaucracy or machine organization was born in the Industrial Revolution, promoting job specialization and standardized work. (Ref. 14, p. 297) This particular organizational configuration requires an elaborate technostructure to design and maintain its systems of standardization, thus formalizing behaviors and plans of actions. (Ref. 14, p. 297) Other primary characteristics of the machine bureaucracy are as follows:

- routine operating tasks
- formalized communication
- large-size operating units
- reliance on the functional basis for grouping tasks
- relatively centralized power for decision-making
- elaborate administrative structure with a sharp distinction between line and staff (Ref. 15, p. 635)

1. Basic Structure

The chain-of-command is the key mechanism to run the machine organization. To achieve high regulation of operating tasks, this type of organization requires a sophisticated administrative structure, consisting of a fully developed middle-line hierarchy and technostructure, which are clearly distinguished. (Ref. 15, p. 635) The middle line managers have three prime tasks:

- Quell disturbances in the operating core, resolving conflict with direct supervision.
- Work with staff analysts to incorporate standards down to operating units.
- Support vertical flows of information up and down the hierarchy.

(Ref. 15, p. 636)

The technostructure is also critical to the basic structure of the machine organization. The cadre of work-study analysts, schedulers, quality control engineers, planners, budget analysts, accountants, operations researchers, and many others standardize the operational functions. (Ref. 15, p. 636) Although the staff analysts do not have formal authority over the operating core, these key players exercise their significant informal power by controlling the rules and regulations of the organization. (Ref. 15, p. 636,637)

2. Conditions

The machine bureaucracy is found in environments that are simple and stable. (Ref. 15, p. 638) In theory, work associated with complex environments cannot be rationalized into simple tasks. Thus, this work cannot be predicted, modeled, or standardized. (Ref. 15, p. 638) Large, mature organizations typically utilize a machine configuration because (1) they can take advantage of large volumes of work by using repetitive and standardized processes; and (2) they are old enough to have established standards. (Ref. 15, p. 638) Mass production firms are perhaps the best-known machine organizations. Their operating work flows through an integrated chain. (Ref. 15, p. 638) These organizations often adopt strategies of vertical integration, extending their production chains at both ends, concurrently becoming their own suppliers and customers. (Ref. 15, p. 638)

However, the machine organization is not limited to use within large, or manufacturing, or private sector organizations. (Ref. 15, p. 638) Small organizations may utilize this configuration, because it fits their simplified, repetitive processes, such as banks or retailing services. (Ref. 15, p. 638). The machine configuration applies to public sector organizations, as well.

Many government departments, such as post offices and tax collection agencies, are machine bureaucracies not only because their operating work is routine but also because they must be accountable to the public for their actions. Everything they do-treating clients, hiring employees, and so on-must be seen to be fair, and so they proliferate regulations. (Ref. 15, p. 638)

3. Role of the Strategic Apex

Managers at the strategic apex are primarily concerned with maximizing efficiency and minimizing conflict at the middle line and operating core. (Ref. 15, p. 637) Strategic apex managers frequently intervene in middle line activities to achieve coordination. Moreover, these managers are the only generalists in the organization with a broad perspective of the organization's functions. (Ref 15, p. 637)

These managers located at the strategic apex exercise considerable power in the machine organization. Since this type of organizational structure is highly centralized, the formal power rests at the top. (Ref. 15, p. 638)

4. Strategy Formulation

In Mintzberg's theoretical framework, strategic thinking occurs and strategy flows from the top of the hierarchy, where managers are enabled to be generalists and view the organization from a broad perspective. (Ref. 15, p. 642) Relevant information flows up from the operating core and middle line, with aid from the technostructure. (Ref. 15, p. 642) "Implementation then follows, with the intended strategies sent down the hierarchy

to be turned into successively more elaborated programs and action plans.” (Ref. 15, p. 642) There is a clear division of labor, between the strategic formulators at the top and the implementers lower in the chain-of-command. (Ref. 15, p. 642)

E. THE INNOVATIVE ORGANIZATON

According to Henry Mintzberg, “to innovate means to break away from established patterns.” (Ref. 15, p. 680) In describing the innovative configuration, Mintzberg uses the terms “innovative organization” and “adhocracy” interchangeably. An innovative organization or adhocracy is defined as:

...a structure that relies for coordination on mutual adjustment among its highly trained and highly specialized experts, which it encourages by the extensive use of the liaison devices-integrating managers, standing committees, and above all task forces and matrix structure. (Ref. 14, p. 302)

There are two types of adhocracies: operational and administrative.

- Operating adhocracy - innovates and solves problems directly on behalf of its clients. A key feature of the operating adhocracy is that its administrative and operating work tend to blend into a single effort. (Ref. 15, p. 681)
- Administrative adhocracy - defined as an organization that undertakes projects to serve itself, to bring new facilities or activities on line, as in the administrative structure of a highly automated organization. (Ref. 15, p. 681)

The innovative organization is found in environments that are complex and dynamic, because “those are the ones that require sophisticated innovation, the type of innovation that calls for the cooperative efforts of many different kinds of experts.” (Ref 14, p. 302)

1. Basic Structure

The innovative organization is structured with a distinctive configuration characterized as follows:

- Little formalization of behavior

- Specialized jobs based on expert training
- A tendency to group specialists in functional units or small project teams
- Considerable decentralization to the team dispersed throughout the organization

The innovative organization does not rely on standardization for coordination, unlike the machine organization. (Ref. 15, p. 680) Many of the aspects of the machine bureaucracy are absent from an adhocracy: sharp divisions of labor, extensive unit differentiation, highly formalized behaviors, and an emphasis on planning and control systems. (Ref. 15, p. 680)

In order for the innovative organization to operate effectively, it must ensure flexibility is built into the structure. (Ref. 15, p. 680) Therefore, “information and decision processes flow flexibly and informally, wherever they must, to promote more innovation. And that means overriding the chain of authority if need be.” (Ref. 15, p. 680) Unlike the machine bureaucracy, where managers predominantly reside at the top of the organization or middle lines, managers are found throughout an innovative organization. Functional managers, integrating managers, and project managers coordinate efforts using informal means of communication and integration. (Ref. 15, p. 680)

2. Conditions

This configuration is found in both dynamic and complex environments. Mintzberg states that a dynamic environment, being unpredictable, calls for organic structure; a complex one calls for decentralized structure. (Ref. 15, p. 685)

Thus, we tend to find the innovative organization wherever these conditions prevail, ranging from guerrilla warfare to space agencies. There appears to be no other way to fight a war in the jungle or to put the first man on the moon. (Ref. 15, p. 685)

Youth is another condition often associated with the innovative organization. "All kinds of forces drive the innovative configuration to bureaucratic itself as it ages."

(Ref. 15, p. 685) Young organizations prefer "naturally organic structures" in order to continue innovation. Administrative adhocracies typically live longer than operational ones. They feel the pressures to bureaucratize, which can cause them to stop innovating or else to innovate within a bureaucratized structure. Many organizations and industries where administrative adhocracies are found tend to retain this configuration for a long period of time. (Ref. 15, p. 686)

3. Role of the Strategic Apex

"The top managers of the strategic apex of this configuration do not spend much time formulating explicit strategies.... They spend a good deal of their time in the battles that ensue over the strategic choices." (Ref. 15, p. 684) This configuration predicates power based upon expertise, not authority. Thus, managers at the strategic apex assume the following roles:

- Masters of human relations, able to persuade, negotiate, and fuse individualistic experts into smoothly functioning teams
- Monitor of multiple projects, to ensure they are completed
- Liaison with the external environment (Ref. 15, p. 684-5)

4. Strategy Formulation

Henry Mintzberg adds that "the structure of the innovative organization may seem unconventional, but its strategy making is even more so, upsetting virtually everything taught about the process." (Ref. 15, p. 687) Because this particular organizational

configuration exists in a dynamic, unpredictable environment, it cannot rely on a formalized structure to formulate, plan, and implement strategy. (Ref. 15, p. 687)

Many actions must be made by individuals throughout the organization to address ongoing needs of the moment; therefore, strategy is not formed in one place, but rather by specific actions in many places. "Any process that separates thinking from action-planning from execution, formalization from implementation-would impede the flexibility of the organization to respond creatively to its dynamic environment." (Ref. 50, p. 687)

F. SUMMARY

Chapter III described the organizational theory model that will be used to analyze the DoD and NASA organizations and their implementation of electronic commerce (EC). The next four chapters, IV, V, VI, and VII will discuss background information on EC, EC policy in the Federal Government, and the implementation of EC within DoD and NASA. Chapter IV specifically defines and discusses EC, Electronic Data Interchange (EDI), and the Internet.

IV. ELECTRONIC COMMERCE AND INTERNET OVERVIEW

A. INTRODUCTION

Transforming acquisitions from a paper-based mode to the electronic exchange of data will not happen overnight, but agencies must move toward electronic commerce quickly in order to be effective as the electronic superhighway becomes a reality.... Various private sector industries have operated in this manner for several years, but never has a single entity as large as the Federal Government made such a transformation. (Ref 16, p. iii)

These words from a 1993 Federal Acquisition Commerce Acquisition Team Report "Streamlining Procurement Through Electronic Commerce" articulate the challenge facing acquisition professionals in the Federal Government to implement electronic commerce. (Ref. 16, p. iii) This chapter will explain definitions and concepts of Electronic Commerce (EC) and Electronic Data Interchange and briefly describe their application in industry and Government. The chapter concludes with discussion of the Internet, its history and use in both the private and public sectors.

B. ELECTRONIC COMMERCE

1. Definition

Electronic Commerce (EC) is the paperless exchange of business information using Electronic Data Interchange (EDI), Electronic Mail (E-mail), Electronic Bulletin Boards (EBB), Electronic Funds Transfer (EFT), and other similar technologies. (Ref. 17, p. 3)

The Federal Acquisition Regulation (FAR) defines Electronic Commerce (EC) as follows:

...as used in this subpart (4.501), means a paperless process including electronic mail, electronic bulletin boards, electronic funds transfer, electronic data interchange, and similar techniques for accomplishing business transactions. The use of terms commonly associated with paper transactions (e.g. "copy", "document", "page", "printed", "sealed envelope" and "stamped") shall not be interpreted to restrict the use of electronic commerce. (Ref. 18, p. 4-3)

“Though it is often defined simply as a computerized means of acquiring goods and services, electronic commerce actually encompasses the entire scope of the business cycle, from product concept to payment.” (Ref 19)

2. Concept

Electronic Commerce is not only EDI. An EC strategy used by a commercial company or Federal agency consists of much more than EDI. All the EC tools, such as EDI, EBB, EFT, and E-mail are not competing technologies, but rather complementary ones. Each EC tool has its place in the overall business strategy and provides unique benefits. (Ref 20, p. 27)

- E-mail is ideal for agencies whose employees are geographically dispersed. The Federal Aviation Administration, for instance, uses an E-mail program to improve communications among 31,000 workers in offices around the country. (Ref 19)
- EBBs are independently developed EC/EDI systems. A bulletin board consists of a computer equipped with a modem and communication software. Bulletin boards allow vendors to obtain a variety of information, including, for example, requests for quotes, data on contractor past performance, contract clauses, contract award summaries, and informational bulletins. (Ref 21, p. 3)
- EFT enables electronic bank accounts to be credited or debited via computer using special codes, thereby eliminating the need for agencies to produce or mail checks. The Treasury Department estimates that making an electronic payment costs only 2 cents, compared to 40 cents for issuing and mailing a paper check. (Ref. 19)

Using electronic commerce to streamline business processes is not necessarily new in the Federal arena. The Department of Veterans Affairs has used Electronic Data Interchange (EDI) since the mid-1980's to facilitate the receipt of invoices, greatly reducing data entry errors and the duplication of effort. (Ref. 22, p. 31) The General Services Administration (GSA) established an EDI program in the late 1980's to transmit

purchase orders and receive invoices through EDI. (Ref. 22, p. 31) Finally, there have been various EDI initiatives within DoD since the early 1990's. "Every branch of the Armed Services has at least one non-standards-based 'EDI' program." (Ref. 22, p. 31)

The benefits of using EC in Federal acquisition are as follows:

- Improve customer satisfaction with the product and service
- Allow the agency to provide the product and service faster
- Allow the agency to provide the product and service at a lower cost
- Improve business processes (Ref 2, p. 2-5)

C. ELECTRONIC DATA INTERCHANGE (EDI)

1. Definition

Electronic Data Interchange (EDI) is the computer-to-computer exchange of business information using a public standard. (Ref. 17, p. 3) Electronic Data Interchange is a central part of EC, because it enables businesses to exchange business information electronically much faster, cheaper, and more accurately than is possible using "paper-based" systems. (Ref. 17, p. 3)

The FAR defines "electronic data interchange" as follows:

...as used in this subpart (4.501), means a technique for electronically transferring and storing formatted information between computers utilizing established and published formats and codes, as authorized by the applicable Federal Information Processing Standards. (Ref 18, p. 4-3)

"Purchase orders, quotations, invoices, and other paper forms have been successfully replaced with standard EDI transactions." (Ref. 2, p. 1-1)

2. Concept

EDI has evolved from its birth in the transportation industry over twenty years

ago. (Ref. 17, p. 3) EDI was used by ocean, motor, air, and rail carriers and the associated shippers, brokers, customs, freight forwarders, and bankers. Prior to the 1970's, prohibitive operating costs and technological barriers of computer-to-computer information exchange limited EDI capability to few large firms. (Ref. 17, p. 3) These early electronic interchanges utilized proprietary formats agreed between the two trading partners. "However, the disadvantages of programming the widely varying formats required by different trading partners mitigated some of the benefits of this method of interchange." (Ref. 23, p. 7)

In the 1960's some industry groups collaborated to develop industry EDI standards for purchasing, transportation, and financial applications. Most EDI supported only intra-industry trading, but some applications such as bills of lading and freight invoices applied across industry lines. (Ref. 23, p. 7) In addition, EDI was developed to streamline business practices in industry on a "one-to-one" basis, in which two trading partners developed long-term relationships in order to implement EDI to meet each of their requirements. (Ref. 9, p. 111) The first set of industry EDI standards were developed by the Transportation Data Coordinating Committee (TDCC). (Ref 17, p. 3) Throughout the 1970's and 1980's, the American National Standards Institute (ANSI) refined both domestic and international EDI standards, including the majority of the transportation and retail industry's EDI standards. (Ref 23, p. 7)

D. ELECTRONIC COMMERCE IN INDUSTRY

1. General

Since the ANSI EDI standards were established, the private sector is taking

advantage of EDI technology in their varied business practices. About fifty thousand private sector companies in the United States, such as Federal Express, Eastman Kodak, American Airlines, Nike, Staples, NationsBank, JC Penney, and Prudential Insurance, currently use EDI. (Ref 17, p. 3) Some examples of industries where EDI is widely used are as follows:

- manufacturing
- shipping
- warehousing
- pharmaceuticals
- petroleum
- banking
- retailing
- government
- health care (Ref 17, p. 3)

The petroleum industry provides several examples of EDI usage:

- The Mobil Corporation - forced 540 of its lubricant product distributors nationwide to use EDI...Mobil now processes more than 80,000 EDI invoices per week. A key benefit has been reducing the time it takes to issue distributor payments from 30 days to two days. (Ref. 24, p. 43)
- The Texaco Corporation - uses EDI with 400 trading partners such as Wal-Mart Stores, Inc. and Kmart Corporation (Ref. 24, p. 43)

2. RJ Reynolds Tobacco Company

The RJ Reynolds tobacco company employed an EC/EDI program, with tremendous results. In 1993, RJ Reynolds did business with 1800 trading partners processing 60,000 purchase orders annually. (Ref. 9, p. 111) In March 1993, they achieved 100 percent electronic transactions with all their trading partners.

In order for RJ Reynolds to achieve 100 percent participation, the company had to make an investment of \$40,000 in assisting five percent of their suppliers to become EC-capable. (Ref. 9, p. 111) As a result, the tobacco giant saved \$840,000 of costs to

manually process those remaining transactions. Additionally, by using EDI-based technology to process transactions in lieu of a manually-based system, the RJ Reynolds Company cut the cost per transaction from \$98.00 per transaction over one-hundred-fold to only \$.93 per transaction. (Ref. 9, p. 111)

E. THE INTERNET

The Internet is an open system defined as “a network of networks, a collection of computer networks, computers, and leased telephone lines. The computer systems are owned and operated by government agencies, educational institutions, corporations, and non-profit organizations throughout the world, all interconnected and working as one, because they adhere to standard protocols.” (Ref. 25)

1. History

The Internet was born as a research project of the Defense Department’s Advanced Research Projects Agency (ARPA) in 1969. The project was named ARPANET. (Ref. 7) Through the 1970’s and the 1980’s, the ARPANET was predominantly used by university research laboratories and integrated into the DoD’s Defense Data Network.

In 1986, the National Science Foundation (NSF) created the NSFNET to connect supercomputer sites around the country. (Ref. 8, p. 167) Legislation championed by Vice President Gore, then a U.S. Senator, expanded the capabilities of the network to include more educational institutions and businesses. (Ref. 8, p. 167) The following timeline marks key milestones of the Internet explosion in the 1990’s: (Ref 7)

- 1990 - ARPANET ceases to exist

- 1991 - The World Wide Web (WWW) is released
- 1992 - The World Bank comes on-line
- 1993 - The White House comes on-line, both President and Vice-President establish E-Mail accounts

WWW browser technology encourages business and media to take notice of the Internet

- 1994 - Shopping Malls arrive on the Internet
- 1995 - Traditional online systems (Compuserve, America Online) begin to provide Internet access
- 1996 - Number of Internet hosts grows to nearly 10,000,000 and continues to grow (Ref. 7)

This brief history of the Internet is important to understand in order to fully appreciate the environment in which Federal Government procurement officials made decisions surrounding EC.

2. Internet in Private Sector

Since 1993, the commercial sector has embraced the Internet technology and incorporated the network into its business practices. (Ref. 7) Through inexpensive on-line subscription services, such as America Online and Prodigy, both small and large businesses can easily access the Internet to streamline business processes. (Ref. 7) Thousands of companies use the Internet to advertise and market their products. Market analysts investigate industry trends and gather information to aid business decisions. (Ref. 7)

One of the largest defense contractors, General Electric (GE) is currently incorporating the Internet into its information technology system in order to create a competitive advantage. (Ref. 26, p. 83)

The challenge now is to harness the bustling , low-cost, and very public Internet as an electronic commerce medium, both to help GE and as the basis for new services that GEIS (GE Information Systems) can sell to others. After a year and a half of testing, GE has started to move its purchasing activities to the Internet. In June 1996, it went live with a setup called the Trading Process Network, which helps match buyers throughout the company with suppliers....The payoff is that GE can select from a broader base of suppliers as well as cut its purchasing costs. (Ref. 26, p. 83)

GE's Trading Process Network also enables suppliers to download GE's requests for proposals, view diagrams of parts specifications, and communicate with GE's managers.

After planning its strategy over two years, General Electric has fully embraced the Internet to streamline many business practices that the Federal Government is striving to improve.

By using the Internet, GE provides one example of many companies encouraging competition by expanding its supplier base while cutting operating costs.

3. Internet in Federal Government

While the business community is aggressively pursuing Internet-based solutions for making business decisions, some agencies within the Government are utilizing the Internet to simplify acquisition processes. (Ref. 27) Some examples of Government agencies using the Internet to improve acquisition processes are provided below.

- The General Services Administration established an Internet web-based system called GSA Advantage to rectify many of its problems.

The on-line procurement system--which eventually will carry all GSA schedule items--is essentially an Internet shopping mall, with stores such as Scientific Equipment Mart, Hardware Store, Industrial Park, Vehicles Store, Specialty Store, Computers and communications...In the spirit of Windows, the ordering system is menu-driven, graphics-oriented, intuitive, and user-friendly. (Ref. 27)

Customers place orders by clicking on desired items and entering desired quantities using their own personal computer. (Ref. 27)

- The US Army Medical Command Health Care Acquisition Activity, while using the FACNET when appropriate, uses the Internet to post FASA-exempt solicitations from nine agencies (Ref. 28)
- The Air Force and the Navy are both investigating the Internet as an alternative method to conduct electronic business. The Air Force is working in conjunction with the National Aeronautics and Space Administration (NASA) to develop a capability to conduct EC for acquisitions over the \$100,000 simplified acquisition threshold. (Ref. 29)
- The National Aeronautics and Space Administration offers synopses, acquisition forecasts, solicitations, award notices, and regulations from all NASA Centers across the country via the web-based NASA Acquisition Internet Service (NAIS). (Ref. 10, p. 22)

These examples represent only a few of the Internet initiatives throughout the Federal Government. The NASA Acquisition Internet Service (NAIS) is discussed in greater detail in Chapter VII.

4. Internet Security

The most prevalent issue to many EC professionals regarding the usage of the Internet for electronic commerce is the issue of transaction security.

The Internet is open and broadly accessible, which makes it a difficult place for commerce. To send messages across the Internet safely, contractors and government will have to shroud their transactions in an additional layer of computer security...any Internet- based system must be able to match the dependability and security of the traditional exchange of paper documents through the U.S. Postal System. (Ref. 30, p. 43)

While Internet technology is progressing, many acquisition professionals believe electronic documents transmitted via the Internet still lack the security of the U.S. postal system.

(Ref 30, p. 43)

The private sector is addressing the transaction security issue with emerging technology designed to protect information exchanged over the Internet, specifically

financial information. Some companies are developing software products, firewall solutions and security networks as safety measures.

In a new development, Visa and Master Card are collaborating to allay consumer concerns about making purchases over the Internet. On February 1, 1996, the companies announced a joint technical standard for safeguarding payment-card purchases made over open networks such as the Internet. (Ref 31, p. 18)

“According to one insurance industry executive, the Internet will never be risk-free, but not taking advantage of the Internet’s tremendous benefits can present bigger problems...most of today’s security risks will be overcome.” (Ref. 31, p. 18)

V. ELECTRONIC COMMERCE POLICY: CHRONOLOGY IN THE FEDERAL GOVERNMENT

A. THE 1993 NATIONAL PERFORMANCE REVIEW

On March 3, 1993, just two months after his inauguration, President Clinton initiated the National Performance Review (NPR), appointing Vice President Al Gore to lead the effort. (Ref. 3) The President gave this intensive review of the Federal Government's business practices a six-month deadline. "The review was largely staffed by about 250 career civil servants. In addition, some interns, state and local government employees on loan, and a few consultants were also engaged in the work of this interagency task force." (Ref. 3) President Clinton directed agencies to also establish their own re-invention teams in order to properly implement recommendations of the NPR task force.

On September 7, 1993, Vice President Gore and the NPR task force presented a final report to the President "From Red Tape to Results: Creating a Government That Works Better and Costs Less". (Ref. 3)

The final report highlighted 119 of the 384 recommendations listed in an appendix. The 38 specific accompanying reports total nearly 2,000 pages and expanded on the 384 recommendations by detailing 1,250 actions intended to save \$108 billion, reduce the number of overhead positions, and improve government operations. (Ref. 3)

Among the many recommendations, the NPR noted that Government must strengthen and broaden its EC/EDI capability within the acquisition system. One of Vice President Gore's recommendations for procurement specifically called for "establishment of a Government-wide program to use EC" for Federal acquisition below a specified dollar

threshold and for those acquisitions and orders that use simplified acquisition procedures.

(Ref. 9, p. i)

The NPR Report also provided “savings due to consolidation and modernization of the information infrastructure” in information technology costs. (Ref. 4, p.3) What the NPR report was alluding to was the National Information Infrastructure (NII). A document released by the Clinton Administration on 15 September 1993, “The National Information Infrastructure: Agenda for Action” defined the NII as a seamless web of communications networks, computers, databases, and consumer electronics that put vast amounts of information at users’ fingertips. (Ref. 32) The DoD was an active participant in developing the NII from the beginning of the project, from which the Defense Information Infrastructure (DII) was developed. (Ref. 32) The DII will be discussed in more detail in Chapter VI.

By December 1993, the President set forth sixteen directives to begin the implementation of the NPR’s recommendations, including an Executive Memorandum promoting the use of EC throughout the Federal Government.

B. PRESIDENT CLINTON’S 1993 MEMORANDUM

On October 26, 1993, President Clinton issued an Executive Memorandum entitled, “Streamlining Procurement Through Electronic Commerce” in which he mandated key objectives and milestones by which to implement EC/EDI capability within the Federal Government. (Ref. 2, p. 1-1) In addition to streamlining the procurement process and promoting cost-effectiveness, President Clinton’s Memorandum added the following:

... the electronic exchange of acquisition information between the private sector and the Federal Government also will increase competition by improving access to Federal contracting opportunities for the more than 300,000 vendors currently doing business with the Government, particularly small business, as well as many other vendors who find access to bidding opportunities difficult under the current system. (Ref. 5, p. 1)

To meet these ends the President set forth the following objectives:

- Exchange procurement information – such as solicitations, offers, contracts, purchase orders, invoices, payments, and other contractual documents – electronically between the private sector and the Federal Government to the maximum extent practical.
- Provide businesses, including small, small disadvantaged, and women-owned businesses, with greater access to Federal procurement opportunities.
- Ensure that potential suppliers are provided simplified access to the Federal Government's electronic commerce system.
- Employ nationally and internationally recognized data formats that serve to broaden and ease the electronic interchange of data.
- Use agency and industry systems and networks to enable the Government and potential suppliers to exchange information and access Federal procurement data. (Ref. 5, p. 2)

The President set forth the following four milestones:

- By March 1994, define the architecture for the Government-wide electronic commerce acquisition system and identify executive departments or agencies for developing, implementing, operating, and maintaining the Federal electronic system.
- By September 1994, establish an initial electronic commerce capability to enable the Federal Government and private vendors to electronically exchange standardized request for quotations, quotes, purchase orders, and notice of awards and begin Government-wide implementation.
- By July 1995, implement a full scale Federal electronic commerce system that expands initial capabilities to include electronic payment, document interchange, and supporting data bases.

- By January 1997, complete Government-wide implementation of electronic commerce for appropriate Federal purchases, to the maximum extent possible. (Ref 5, p. 2)

C. THE FEDERAL ELECTRONIC COMMERCE ACQUISITION TEAM

In order to quickly and accurately respond to the Executive Memorandum, Federal agencies formed a Federal Electronic Commerce Acquisition Team (ECAT) comprised of both procurement and information technology specialists from the Executive Agencies. (Ref. 2, p. iv) On 3 January 1994, the Office of Federal Procurement Policy (OFPP) tasked the ECAT to develop a plan to implement an electronic commerce capability within 120 days. (Ref. 2, p. x) The ECAT issued their initial report in April 1994 and the final report was issued on 13 October 1994. In order to effectively implement EC in the Federal Government within the 3-year window, the ECAT recommended the Executive departments and agencies take the following actions:

- Coordinate and harmonize appropriate portions of their policies, practices, procedures, and systems so that they present a “single face” to the private sector for all aspects of Federal government acquisition.
- Pursue the implementation of EC in two phases: first, a near-term approach to implement an initial core capability by September 30, 1994, to conduct some of their business by EC; and second, by January 1997, implement EC throughout the Federal government for all appropriate Federal Government purchases.
- Organize and use resources to conduct acquisition and related financial transactions over a “virtual network” that will link all appropriate buyers and sellers in an electronic marketplace.
- Participate with OFPP and the President’s Management Council Electronic Commerce Task Force by developing individual agency plans for implementing EC in acquisition in accordance with the President’s memorandum of October 26, 1993. (Ref. 2, p. xiv)

The Deputy Under Secretary of Defense (Acquisition Reform) directed the formation of the DoD Electronic Commerce in Contracting Process Action Team (DoD ECIC PAT) in

July 1993 to analyze DoD's current EC capability and develop an implementation plan. (Ref. 9, p. 3) This effort was separate from and initiated six months prior to the Federal ECAT's efforts. The DoD ECIC PAT and their report will be discussed in greater detail in Chapter IV.

D. THE 1994 FEDERAL ACQUISITION STREAMLINING ACT

Congress passed the Federal Acquisition Streamlining Act (FASA) (Public Law 103-355) on 13 October 1994. The legislation provided additional specific guidance.

1. Federal Acquisition Computer Network Mandate

Section 9001 of the FASA mandated the Government establish a Federal Acquisition Computer Network (FACNET) architecture. (Ref. 16, p. 3399) The Administrator of OFPP was designated with the responsibility for establishing and developing this Government-wide architecture that would provide interoperability among users. The legislation required "government-wide FACNET capability by January 1, 2000." (Ref. 16, p. 3399)

2. Federal Acquisition Computer Network Definition

The FASA mandated the establishment of a "government-wide Federal Acquisition Computer Network (FACNET)", but no concrete definition of FACNET is provided within the language of the FASA legislation, allowing for variation in interpretation. (Ref. 16, p. 3400) Thus, the term "FACNET" is open to wide interpretation. Several definitions found in Government acquisition documents are provided:

- The Federal Acquisition Regulation (FAR) defined FACNET in the 26 August 1996 Federal Acquisition Circular (FAC) 90-40 as the "Government-wide Electronic Commerce/Electronic Data Interchange (EC/EDI) operational capability for the acquisition of supplies and services that provides for electronic data interchange of acquisition information between the Government and the private sector, employs nationally and internationally recognized data formats, and provides universal user access." (Ref. 18, p. 2-2)
- The General Services Administration (GSA) currently defines FACNET on their World Wide Web site as of November 1996 as the "Name the Federal Acquisition Streamlining Act of 1994 gave to the systems architecture developed by the Electronic Commerce interagency group. This system allows agencies to transmit RFQ's through a central network so that they are available to all potential vendors, who can then bid electronically and receive their purchase orders electronically, all through the same network." (Ref. 30, p. 35)

While the FASA never defined the term "FACNET", the legislation did provide a broad definition for the term "architecture." The language in FASA defines "architecture" as "the conceptual framework that uses a combination of commercial hardware and commercial software to enable contractors to conduct business with the Federal Government by electronic means." (Ref. 16, p. 3400)

3. Functions Defined

Functions for the FACNET architecture were defined and are provided below:

GOVERNMENT FUNCTIONS - Allow executive agencies to do the following functions electronically:

- Provide widespread public notice of solicitations for contract opportunities issued by an executive agency
- Receive responses to solicitations and associated requests for information through such system
- Provide public notice of contract awards (including price) through such system

- In cases in which it is practicable, receive questions regarding solicitations through such system
- In cases in which it is practicable, issue orders to be made through such system
- In cases in which it is practicable, make payments to contractors by bank card, electronic funds transfer, or other automated methods
- Archive data relating to each procurement action made using such system

PRIVATE SECTOR USER FUNCTIONS - Allow private sector users to do the following electronically:

- Access notice of solicitations for contract opportunities issued by an executive agency
- Access and review solicitations issued by an executive agency
- Respond to solicitations issued by the executive agency
- In cases in which it is practicable, receive orders from the executive agency
- Access information on contract awards (including price) made by the executive agency
- In cases in which it is practicable, receive payment by bank card, electronic funds transfer, or other automated means

GENERAL FUNCTIONS -

- Allow the electronic interchange of procurement information between the private sector and the Federal Government and among Federal agencies
- Employ nationally and internationally recognized data formats that serve to broaden and ease the electronic interchange of data
- Allow convenient and universal user access through any point of entry (Ref. 16, pp. 3399,3400)

4. Simplified Acquisition Threshold

Section 4001 of the FASA of 1994 replaced the \$25,000 small purchase

threshold with a new \$100,000 Simplified Acquisition Threshold (SAT). (Ref 16, p. 3338) The language in FASA directly connected a Federal agency's ability to use the new SAT to the agency's implementation of FACNET.

E. FEDERAL ACQUISITION REGULATION POLICY

FAR Subpart 4.5 provides the policy and procedures regarding electronic commerce in contracting for the entire Federal Government. The policy reads as follows:

- The Federal Government shall use FACNET whenever practicable or cost-effective. Contracting officers may supplement FACNET transactions by using other media to meet the requirements of any contract action governed by the FAR.
- Before using FACNET, or any other method of electronic data interchange, the agency head shall ensure that the electronic data interchange system is capable of ensuring authentication and confidentiality commensurate with the risk and magnitude of the harm from loss, misuse, or unauthorized access to or modification of the information. (Ref. 18, p. 4-3)

F. SUMMARY

Electronic Commerce in the Federal Government evolved from recommendations from the NPR and President Clinton's Executive Memorandum. The Federal ECAT put the president's mandate into action. The FASA required the Government to establish a Government-wide FACNET architecture and mandated the Government have Government-wide FACNET capability by the year 2000. Chapter VI discusses how Electronic Commerce evolved within the Department of Defense.

VI. ELECTRONIC COMMERCE IMPLEMENTATION IN THE DEPARTMENT OF DEFENSE

A. INTRODUCTION

Five years prior to the Presidential Memorandum on Electronic Commerce in 1993, the Department of Defense initiated its own direction for use of electronic media in its internal and external business practices. "A 1988 Deputy Secretary of Defense memo, addressed to the military services and agencies, solicited maximum use of EDI, based on ten years of DoD EDI experiences." (Ref 9, p. 3) In 1989, DoD began the Corporate Information Management (CIM) initiative. The CIM Procurement Council aimed to standardize information systems and business processes throughout DoD. (Ref 9, p. 11)

These actions directly preceded a Defense Management Review Decision (DMRD) which articulated a more specified strategy. In 1990, DMRD 941 stated:

The strategic goal of DoD's current efforts is to provide the department with the capability to initiate, conduct, and maintain its external business related transactions and internal logistics, contracting, and financial activities without requiring the use of hard copy media. This DMRD specifically identified 16 contractual documents that were the substance of its overall direction for DoD's elimination of the associated contracting paper transactions and directed that 96 percent of all the documents be accomplished by EC/EDI (Ref. 9, p. 201)

In December 1992, the DoD revalidated DMRD 941. The updated DRMD stated that DoD's EC/EDI strategy was not only acceptable but rather economically desirable in the current political and economic environment. According to DMRD 941, EC/EDI produced a "tremendous return on investment" and fully supported modernization of the operational bases and DoD acquisition and payment process. (Ref 9, p.202)

Section 800 of the Fiscal Year 1991 National Defense Authorization Act (Public Law 101-510) established a DoD Acquisition Law Advisory Panel (the Section 800 Panel) to simplify acquisition law. "In January 1993, the Section 800 Panel issued a 1,800 page report recommending significant changes to the current defense procurement system." (Ref. 33, p. 9) The report made hundreds of recommendations, but several communicated the potential of EC/EDI technology facilitating the procurement process. (Ref. 9, p. i)

On 12 February 1993, a CIM Procurement Council Conference highlighted the progress of some of the EC/EDI projects within several of the Services and the Defense Logistics Agency (DLA). (Ref. 34, p.1)

- The Air Force presented a discussion on the Government Acquisition Through Electronic Commerce (GATEC) project at Wright-Patterson Air Force Base. The Air Force noted that GATEC had processed 30,000 EC transactions, resulting in 2,000 awards. (Ref. 34, p. 1)
- The Navy had several major EC projects underway: Integrated Technical Item Management and Procurement System (ITIMP) at the Naval Aviation Supply Office (ASO) and the Electronic Assisted Solicitation Exchange (EASE) system used by 660 buyers and over 1800 contractors. (Ref. 34, p. 1)
- The Army discussed its Standard Army Automated Contracting System (SAACONS) used by 25 sites and over 650 contractors. (Ref. 34, p. 1)
- The DLA discussed the Paperless Order Placement System (POPS), which was used by 224 contractors. (Ref. 34, p. 1)

B. THE ORGANIZATION

1. Overview

The Department of Defense is the largest of the executive agencies, employing 800,300 civilian and 1,481,700 military personnel. (Ref. 3) The DoD organization, as it stands today, was established nearly fifty years ago.

By authority of the National Security Act of 1947, the National Military Establishment was created on September 18, 1947....The act was amended in 1949, renaming the National Military Establishment the Department of Defense....A chairman of the Joint Chiefs of Staff was added; the Secretary of Defense was elevated to cabinet rank and the military departments were placed under the Defense Department without cabinet status. (Ref. 35)

The National Military Establishment consolidated three separate Armed Services, the Army, Air Force, and Navy and numerous supporting agencies into one Executive Agency. (Ref. 35)

Until 1947, the Armed Services, with the exception of the Air Force, had operated independently since they were established in the latter part of the eighteenth century. The Army was created by Congress under the title of "Department of War" in 1789. (Ref. 36) The Army was then incorporated in the National Military Establishment in 1947 under the title "Department of Army". The Navy has an established history, as well, created by Congressional enactment in 1798 (Ref. 37)

Each of the military Services is separately organized under its own secretary, but functions under the control of the Office of the Secretary of Defense. Thus, the chain of command descends directly from the President to the Secretary of Defense to the military departments, except for operational matters. (Ref. 35) Figure 6-1 on the following page depicts a simplified organizational chart of the Department of Defense.

2. Mission and Goals

The DoD mission as stated by Secretary of Defense, the Honorable William J. Perry, follows:

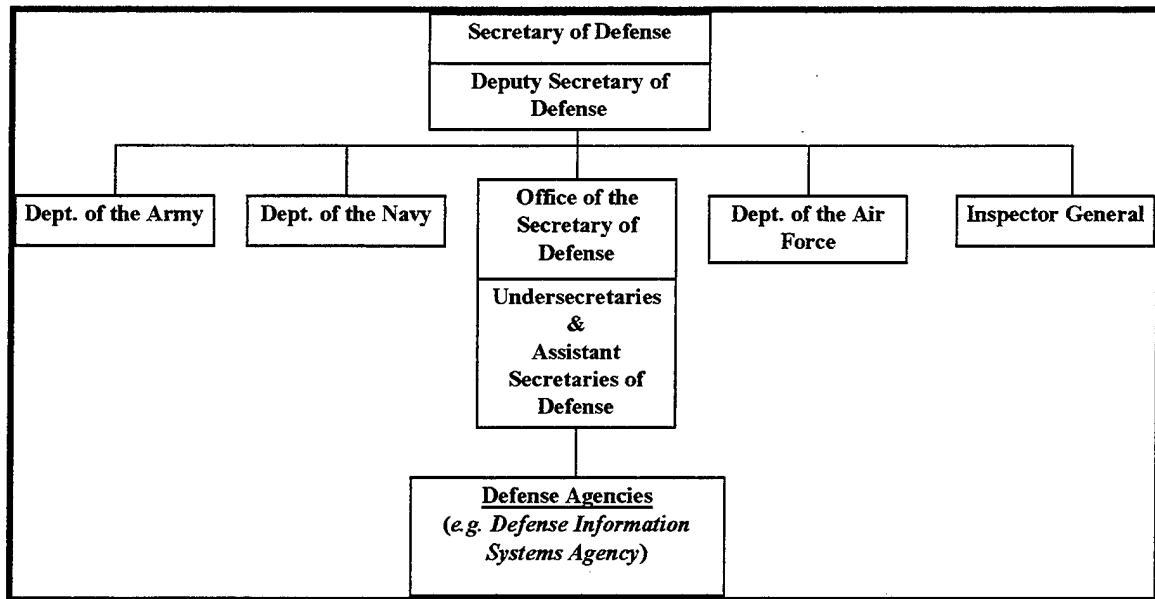


Figure 6-1: DoD Organizational Chart, (Ref. 38)

- Prevent threats to our security from emerging nations.
- Maintain well-trained, ready forces able to deter or respond quickly to a range of potential threats and prepared to seize opportunities.
- Defend the national interest through military force as a last resort and after balancing the risks and costs associated with such intervention.
- Use military forces in certain specific situations to address humanitarian crises when other approaches have failed. (Ref. 3)

Additionally, Secretary Perry points to specific goals to accomplish the mission:

- Reinvention - The Department will also undertake a new round of modernization through increases in expenditures, while achieving significant savings from infrastructure reductions of base closings, defense acquisition reform, and outsourcing of additional support activities. (Ref. 3)
- Downsizing - During the Fiscal Years 94 and 95, civilian reductions have amounted to 110,000 or 12 percent of the workforce. The reduction plan for FY's 1996-1999 should produce a reduction of another 100,000 civilians. Thus, by FY 1999, DoD expects to have cut its civilian workforce by 210,000, or 23 percent. (Ref. 3)

- Acquisition Reform - In FY 1994, the Department implemented the Electronic Commerce/Electronic Data Interchange system for the procurement of items within the simplified acquisition threshold. The system will allow vendors to connect with commercial value-added network that access the entire DoD system at one primary and one backup site and receive data on all planned purchases. (Ref. 3)

Secretary Perry concludes with the following statement:

As the Department of Defense completes the transition to a post-Cold War military force, it has undertaken policies and programs to prevent threats to our security from emerging; and to maintain well-trained ready forces able to deter or respond quickly to a range of potential threats. The Department is moving rapidly to change the way it manages its resources so that it can use them efficiently, reducing overhead costs and ensuring a strong military force into the future. (Ref. 3)

C. ELECTRONIC COMMERCE PROCESS ACTION TEAM

From 1988 to 1993, EDI technology was gaining support throughout the DoD as DMRD 941 and the Section 800 Panel Report provided broad guidance to implement EC. In July 1993, the Deputy Under Secretary of Defense (Acquisition Reform) DUSD (AR) established a DoD Electronic Commerce in Contracting (ECIC) Process Action Team (PAT) staffed with representatives from all Services to develop and implement a comprehensive standard plan to infuse EC/EDI into DoD procurement. (Ref. 9, p. 3)

On July 22, 1993, The Deputy Under Secretary of Defense for Acquisition Reform (DUSD(AR)) directed the chairman of the Corporate Information Management (CIM) Procurement Council to form an integrated decision/process action team. The team's purpose was to immediately assess the Department's current EC capability in contracting and to develop a comprehensive plan for the implementation of EDI, or paperless procurement systems, for the procurement of simplified purchases within six months. (Ref. 9, p. 3)

The DoD ECIC Team analyzed the procurement environment to determine where they should focus their efforts. (Ref. 9, Vol. 2, p. 1)

In Fiscal Year 1992, more than 1,400 DoD contracting offices participated in performing a total of 11,851,000 transactions of \$25,000 or less. Approximately

10.2 million of these transactions (85 percent) were performed by the 238 DoD activities which accomplished 10,000 or more such actions in FY 92. (Ref. 9, Vol. 2, p. 1)

The ECIC Team determined that 98 percent of DoD's transactions fall below the \$25,000 threshold and that "these actions below the \$25,000 small purchase threshold represent the best target for DoD's EDI initiative in contracting." (Ref. 9, Vol. 2, p. 1)

In addition, the team recognized the EC efforts of the Services, but noted some lacked the capability for further development. "It is apparent that DoD has many excellent EC efforts underway. However, several...did not meet a baseline of criteria to be a viable application for expanding." (Ref. 9, p. v)

The primary objective for the DoD Electronic Commerce in Contracting (ECIC) Team was "to provide for the expansion of electronic commerce in DoD procurement through component sponsored EDI initiatives." (Ref. 9, p. 12) More specific objectives of the PAT are provided below:

- Provide an assessment analysis of the current DoD EC/EDI capability in contracting in order to determine achievable near-term progress.
- Evaluate DoD EC capability to support competitive procurement and improved access and notice to small businesses in support of increasing the simplified acquisition threshold.
- Identify any relevant EC policy issues related to near-term and long-term EC implementation.
- Assess EC/EDI systems (current and future) to include hubs, networks/gateways, Value-added networks. The purpose of this task is to identify likely future developments for which options should be maintained in the implementation of current and available capabilities and systems.
- Identify issues and assess potential areas of risk and uncertainty related to near-term EC.

- Develop a comprehensive plan with specific time-phased recommendations. The plan should identify options, including estimates of resources required to achieve a rapid expansion of EC in contracting within DoD.
- Recommend implementation and deployment of a system that would provide a "single face to industry."
- Ensure that all interested suppliers, regardless of size or location, can have equal access to all solicitations on a "one-to-all" basis. Some procurements may require restricted distribution. (Ref. 9, pp. 4,17)

The DoD ECIC PAT analyzed DoD's electronic commerce capability for nearly five months and issued a 219-page final report on 20 December 1993. The report stressed the necessity of implementing electronic commerce initiatives and furthering efforts to employ simplified acquisition procedures.

The Department of Defense (DoD) must rapidly implement Electronic Commerce (EC) initiatives and seek process, statutory, and regulation changes that will support the objective of implementing meaningful acquisition reform. The DoD Acquisition Law Advisory (Section 800) Panel's recommendations on raising the small purchase threshold to \$100,000, coupled with the need to provide adequate notice of procurement opportunities for small businesses and ensure competitive procurement make immediate expansion of EC capabilities more critical than ever. (Ref. 9, p. xxix)

The PAT presented many conclusions and recommendations in order to execute DoD's implementation plan for EC. Conclusions and recommendations in key areas are as follows:

- Functional EC/EDI initiatives: Current EC/EDI initiatives can support near term efforts and should be used as a baseline for future DoD standard systems.
- Technical Assessments and Analysis: Although the legacy systems assessed during the EC in Contracting PAT adequately support DoD procurement in the near term; migration toward a standard DoD system is required to reap the full benefits afforded by EC/EDI.
- Policy Issues: Current regulations do not preclude the procurement community from doing business electronically. However, we must recognize

the EC/EDI methodology and provide for flexibility in our procurement processes.

- **Government/Industry Benefits:** The EC in Contracting PAT review determined that EC/EDI offers a significant increase in the efficiencies and effectiveness of the procurement process. We believe that the initial benefits realized will grow as the procurement process is reengineered to take full advantage of the inherent strengths of EC/EDI and the number of contractors participating in the process increases. (Ref. 9, p. 4)

Two guiding principles that repeatedly appeared in the DoD Electronic Commerce in Contracting PAT Report were that (1) EC and the DoD EDI architecture were vital to the overall acquisition reform initiatives and (2) the DoD architecture would make maximum use of the existing and emerging systems of the DoD Information Infrastructure. (Ref. 9, pp. 11,19)

On 5 January 1994, the Under Secretary for Defense (Acquisition and Technology), the Honorable John M. Deutch directed the Under Secretary for Acquisition Reform, Colleen A. Preston to execute the implementation plan as set forth in the DoD ECIC PAT Report. (Ref. 6, p.1) The memorandum noted the necessity of electronic commerce to the acquisition workforce. Along with directing the implementation of DoD's Electronic Commerce in Contracting Plan, Dr. Deutch requested that Mrs. Preston advise him of the progress achieved on a quarterly basis, beginning in April 1994.

D. ELECTRONIC COMMERCE OFFICE

Colleen Preston established the DoD Electronic Commerce Office in February 1994. She appointed Ms. Delores "Dee" Smith as the Director of DoD Electronic Commerce. The initial responsibility of the DoD EC Office is implementing recommendations from the PAT Report and implementing EDI-based contracting systems at 244 installations within DoD, which initiate 98-percent of DoD's small purchases. (Ref.

17, p. 13) According to the DoD EC Office, the DoD EC plan, when implemented, will enhance small businesses' access to small purchase RFQ's and ensure the Government's capability to support EDI-based procurements up to \$100,000 in accordance with the Federal Acquisition Streamlining Act. (Ref 39)

E. INFRASTRUCTURE

1. General

In their 20 December 1993 report, the DoD Electronic Commerce in Contracting Process Action Team (DoD ECIC PAT) recommended the DoD EC/EDI architecture be based upon a single infrastructure. Nearly a year later, Congress passed FASA in October 1994, which directed establishment of the Federal Acquisition Computer Network (FACNET) throughout the Government.

The DoD ECIC PAT report also recommended that DoD capitalize existing systems, hardware, and software to further develop its infrastructure. (Ref. 9)

The hardware, software, and communications infrastructure components necessary for the implementation of EDI are in place. The DoD EC/EDI systems infrastructure is the interconnected communications and computer capability supporting the exchange of EDI transactions between Government agencies and their trading partners. This infrastructure consists of a seamless network of Gateways, Electronic Commerce Processing Nodes (ECPNs) and Value-Added Networks (VANs) through which electronic documents flow. (Ref 17, p. 15)

2. Defense Information Systems Agency

The DoD acquisition infrastructure includes two independent agencies, the Defense Logistics Agency (DLA) and Defense Information Systems Agency (DISA). The DLA provides supplies and services that are common to all the Services, procuring material and operating a world-wide distribution system. The DISA is the agency responsible for information technology, managing the Defense Information Infrastructure

(DII) and maintaining and operating a global communications system for the Armed Services. (Ref. 40)

On 1 October 1993, the Defense Management Review Directive (DMRD) 918 renamed the Defense Communications Agency (DCA), establishing DISA. (Ref 41) "DISA is subject to the direction, authority, guidance, and control of the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) (Assistant SECDEF)(C3I)." (Ref. 40) The Assistant SECDEF (C3I) Mr. Emmett Paige, responsible for implementing EC/EDI in DoD, designated DISA as the executive agent responsible for developing EC/EDI technology for DoD and establishing the DoD EC/EDI infrastructure. (Ref 42, p.2) In a 23 June 1995 memorandum, Mr. Paige stated that DoD was committed to implementing EC/EDI, using the DII infrastructure that DISA had established.

DISA is tasked with providing EC/EDI infrastructure support, standards definition, information security infrastructure, and implementation guidance for all business systems as part of the Defense Information Infrastructure. (Ref 43, p.1)

3. Defense Information Infrastructure

The Defense Information Infrastructure is a "seamless web of communication networks, computers, software, databases, applications, data...that meets the information processing needs of DoD users in peace and wartime roles." (Ref 44, p. 1) The DII includes the following components:

- Physical facilities used to collect, distribute, store, process and display data
- Applications and data engineering practices to build and maintain the software
- Standards and protocols that facilitate interconnection and interoperability among networks
- People and assets which provide the integrating design, management and operation of the DII (Ref. 44, p. 1)

4. Components of the Infrastructure

The following are key components of the DoD EC/EDI infrastructure:

- Gateway - consists of both hardware and software that provide EDI translation services, archiving, security, and environment management for converting non-standard business application systems data into a standard ANSI X12 format to Government procurement agencies. Gateways typically support numerous Government business systems. Gateways serve as the point of access to the Federal Acquisition Network (FACNET).
- Electronic Commerce Processing Node (ECPN) - a collection of hardware and software systems which provides communications connectivity between Value-Added Networks (VANs) and the Government Gateways to support the exchange of EDI transactions between Government procurement agencies and private sector Trading Partners. There are currently two ECPN's, located in Columbus, Ohio and Ogden, Utah.
- Value-Added Network (VAN) is a third party communications network that may also provide services, such as electronic mailboxes, where registered Trading Partners can retrieve a document and reply electronically. (Ref. 17, p. 16)

F. POLICY FROM THE DEPUTY SECRETARY OF DEFENSE

Four months after the DoD ECIC PAT Report was approved for implementation by the Under Secretary of Defense (Acquisition and Technology), the Deputy Secretary of Defense issued a memorandum on 28 April 1994 regarding DoD's efforts in implementing an EC/EDI procurement system. (Ref. 45, p. 1) The memorandum reiterated that the PAT report provided a comprehensive plan to implement a standard DoD EC/EDI procurement system and that the plan had been coordinated with all the Military Services and Defense Agencies. (Ref. 45, p. 1)

According to the memo, DoD components were independently developing EC/EDI projects to address their contracting situations, therefore proliferating non-standard systems. The memo provided the following points:

- Vendors who submitted quotes using a Department-unique system were unable to conduct business with another DoD organization.
- A standard DoD system would provide a single-face-to-industry by allowing contractors to obtain information on pending DoD small purchases, obtain copies of solicitations, submit quotations, and receive awards through a single point-of-entry.
- The use of nonstandard EC/EDI capable small purchase systems shall be discontinued as soon as the standard DoD-wide EC/EDI system is fully operational at a particular activity.
- No funding will be expended to upgrade, further deploy, or expand existing non-standard EC/EDI systems, or implement new non-standard EC/EDI systems unless specifically approved by the Deputy Under Secretary of Defense (Acquisition and Technology) and the Director, Defense Information Systems Agency. (Ref. 45, pp. 1-2)

G. SUMMARY

The Services within DoD were pursuing EC and EDI long before President Clinton mandated implementation of EC throughout Government. Ms. Colleen Preston formed the DoD Electronic Commerce in Contracting PAT in order to develop a standardized systems architecture using software and hardware from existing network architectures. DISA was charged with developing the DoD EC/EDI Infrastructure and incorporating it with the Defense Information Infrastructure. Chapter VII describes how NASA used a different approach than DoD to implement the mandates and milestones of the Presidential Memorandum.

VII. ELECTRONIC COMMERCE IMPLEMENTATION IN THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

A. INTRODUCTION

NASA did not launch a coordinated effort to implement EC throughout all its Space and Aeronautical Centers prior to President Clinton's Mandate in October 1993 to implement EC in Government. Prior to the Executive Memorandum, only the Goddard Space Flight Center experimented with electronically-based procurement. At Goddard, the procurement office piloted a system to transfer electronic Blanket Purchase Agreement (BPA) orders via their E-Mail system. However, this technology was not incorporated into an integrated electronic procurement system. (Ref 46)

The Executive Memorandum from President Clinton set forth specific objectives and milestones for Federal agencies to implement electronic commerce. These objectives and milestones are discussed in their entirety in Chapter V. The first two milestones occurred in 1994 and are as follows:

- Mar 1994 - Define the architecture for the EC acquisition system (Ref. 5, p. 2)
- Sep 1994 - Establish an initial electronic commerce capability (Ref. 5, p. 2)

NASA satisfied requirements to meet the first objective and milestone by participating in the Federal ECAT. (Ref 46) In order for NASA to meet the second requirement, one of their procurement offices had to "establish a capability to exchange standardized request for quotations, quotes, purchase orders, and notice of awards." (Ref. 5, p. 2)

NASA initiated an EDI pilot program using the Internet at one of their Space Centers in the Spring of 1994 in order to meet the requirements of the Presidential

mandate. "The EDI initiative, launched at NASA's Goddard Space Flight Center sprang from the agency's need to meet the electronic commerce goals set for Government by President Clinton." (Ref 47, p. 25) At Goddard, NASA closely worked with eight vendors in order to successfully transmit orders electronically. NASA ensured that these transactions transmitted over the Internet were secure by using a commercial EDI encryption software application. (Ref 47, p. 25) In addition to addressing transaction security on the Internet, procurement personnel at Goddard also discovered cost savings in using an Internet-based EDI system instead of a value-added network. "The Internet holds some advantages over traditional value-added networks for electronic commerce. When you send EDI messages over the existing private networks, you pay by the drink for each message." (Ref 47, p. 25)

B. MISSION AND ORGANIZATIONAL STRUCTURE

NASA was established by the National Aeronautics and Space Act of 1958.

The mission of NASA is as follows:

The National Aeronautics and Space Administration conducts research for the solution of problems of flight within and outside the Earth's atmosphere and develops, constructs, tests, and operates aeronautical and space vehicles. It conducts activities required for the exploration of space with manned and unmanned vehicles and arranges for the most effective utilization of the scientific and engineering resources of the United States with other nations engaged in aeronautical and space activities for peaceful purposes. (Ref. 38, p. 607)

NASA fulfills this mission from eleven different locations throughout the country.

NASA Headquarters is located in Washington, D.C. and is responsible for the planning, coordinating, and controlling of programs. The senior official in NASA, located at headquarters is the Administrator of NASA, the Honorable Daniel S. Goldin. The senior

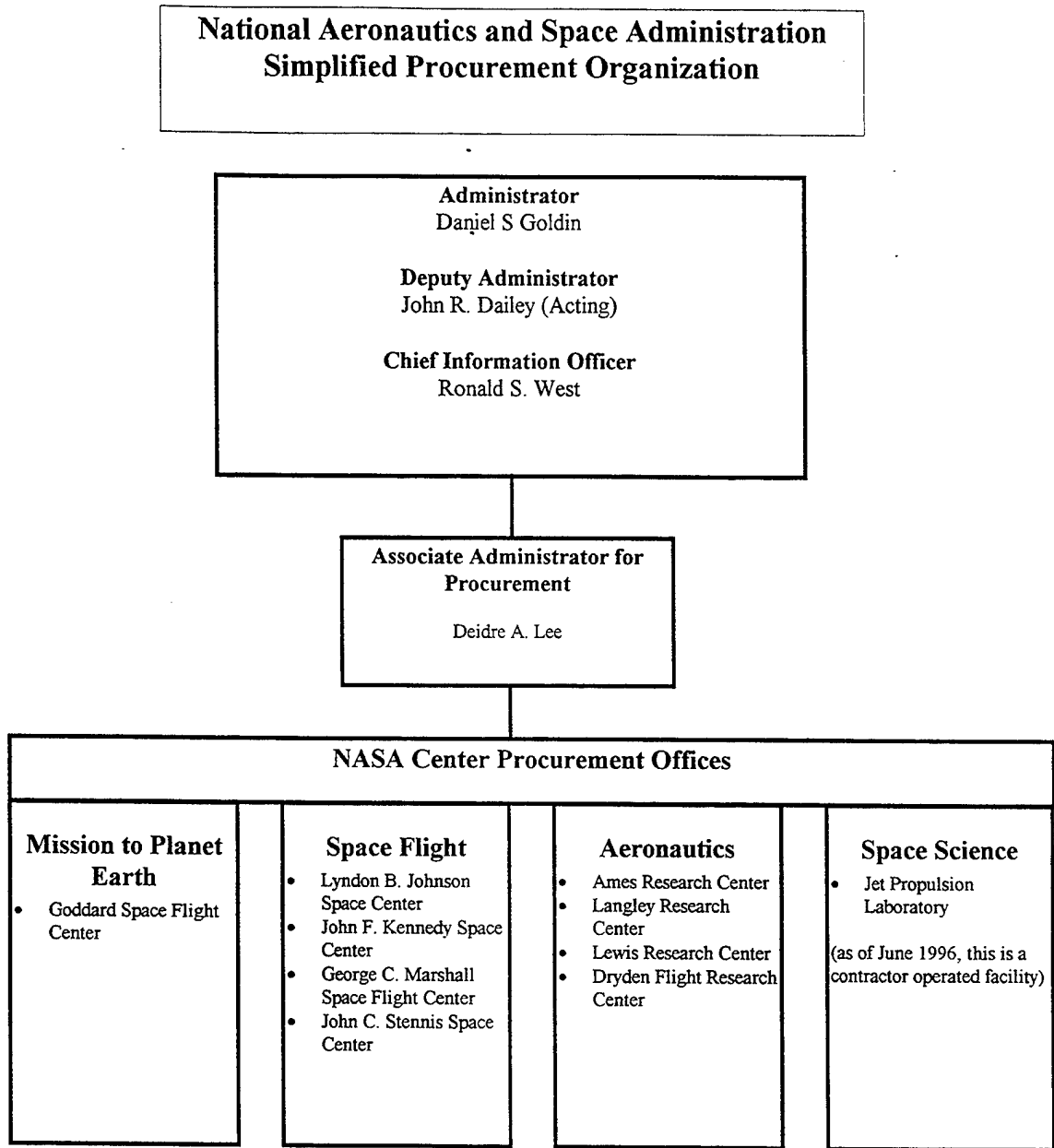


Figure 7-1: NASA Procurement Organization Chart, (Ref. 29)

procurement official in NASA is the Associate Administrator for Procurement, the Honorable Ms. Deidre Lee. Ten Space and Aeronautical centers dispersed throughout the United States perform the day-to-day operations of NASA. Figure 7-1 on the previous page depicts a simplified organizational structure of NASA, identifying key leadership and the breakdown of the NASA centers. Each of the ten centers is independently run by a director and has an on-site procurement activity, directed by a procurement officer. For matters of procurement, the procurement officer has a direct line of communication with the Associate Administrator, bypassing the heads of each NASA Center.

C. ANALYSIS OF ALTERNATE ELECTRONIC COMMERCE MEDIA

In the Spring of 1994, while the Goddard Space Flight Center developed its pilot program for EDI, NASA collected a team of procurement analysts from all ten Space and Aeronautical Centers to examine alternate electronic commerce methods. (Ref. 10, p. 23) The team devoted several months visiting Government agencies and organizations experienced in electronically transmitting business data. During this period, the team investigated the Internet and greatly increased their knowledge of the World Wide Web (WWW). "Although NASA scientists and engineers have been part of the Internet since its inception, procurement representatives were just beginning to realize the tremendous potential for doing business on the world wide network." (Ref 10, p. 23)

The team analyzed three principal electronic transmission applications:

- Electronic Bulletin Boards
- EDI
- The Internet/WWW.

1. Electronic Bulletin Boards

The NASA team looked into the possibilities of utilizing dial-up bulletin boards, but discounted this methodology because of cost and complexity considerations. (Ref. 10, p. 23) Although this technology had performed successfully in the Federal Government for two decades, the team concluded the bulletin boards were too expensive to operate. Additionally, using this approach required the contractor to use non-standard proprietary services, which NASA preferred to not use. Finally, using bulletin boards for EC required different operating instructions, potentially making procurement a cumbersome process. (Ref. 10, p. 23) For example, each electronic bulletin board that a prospective offeror might use would require learning unique keystrokes and commands for each service. (Ref 10, p.23) As the number of bulletin boards grew, the more complex and laborious the vendor's search for on-line procurements became. (Ref 25, p.1)

2. Electronic Data Interchange

Many EDI applications were ruled out because of their complexity and their cost. (Ref. 10, p. 23) According to the NASA team, EDI technology was ideal for transmitting data for simpler acquisitions that are easily standardized. For example, replenishment of office supplies, accomplished by using simple item descriptions and model numbers, is a prime candidate for standardized EDI transaction formats. However, NASA did not completely dismiss EDI, pursuing EDI solutions similar to that of the Veteran's Administration (VA). (Ref 10, p. 23)

The Veteran Affairs (VA) EDI program, which supports huge supply inventories, is a prime example. The VA establishes and maintains strong relationships with its suppliers and negotiates the pricing in advance. Based on predetermined pricing arrangements, the VA annually passes thousands of delivery

orders in the form of EDI transactions to its suppliers on a one-to-one basis. (Ref. 10, p. 23)

The team determined most of NASA's acquisitions were not simple, high-volume transactions, but instead were procurements requiring elaborate solicitation descriptions of special equipment and services. (Ref. 10, p. 23) Subsequently, these intricate solicitations resulted in detailed proposals from potential offerors. "Force-fitting the larger contract acquisitions into the current EDI transaction formats would be too complex and costly - even more so when trying to openly compete acquisitions with many companies." (Ref. 10, p. 23)

3. Internet/World Wide Web

Lastly, the team investigated the Internet and World Wide Web (WWW) technological developments. "The Internet offered an immediate solution for wide distribution of complex, highly detailed procurement documents in electronic format." (Ref 10, p. 23) The recent technological developments and relaxed restrictions on commercial activity made the Internet an attractive option for conducting EC. Complex computer commands were replaced with point-and-click tools. Additionally, the WWW services were user-friendly because documents could be linked together. (Ref 10, p. 23)

In the Spring of 1994, the team selected the WWW approach and spent the next six weeks establishing NASA's inaugural procurement site on the Internet. (Ref. 10, p. 24) Marshall Space Flight Center provided a test site for the pilot procurement service, eventually named the NASA Acquisition Internet Service (NAIS).

D. THE NASA ACQUISITION INTERNET SERVICE

1. Mid-Range Pilot Program

In the procurement reform act (FASA) President Bill Clinton signed last week (Oct 13, 1994) NASA was granted authority to test soliciting bids for mid-range procurement on the Internet. Such contracts range from \$25,000 to \$500,000 annually and must total no more than \$2.5 million over five years. While they account for just 11% of the total dollar value of NASA procurements, they represent four-fifths of the agency's contract actions. (Ref. 48, p. 58)

Because eighty percent of NASA's contract actions are processed in the price range between \$25,000 and \$500,000, NASA established the four-year Mid-Range pilot program in 1993 to continue into 1997. The Mid-Range pilot program was designed to reduce transaction costs and labor resources for Government and industry. (Ref. 10, p. 22) "Mid-range" covers those acquisitions that fall between the simplified acquisition threshold and larger contracts; the program derived its name from this middle range of contracts. (Ref. 10, pp. 22-23) The program successfully streamlined NASA's procurement functions by employing small, dedicated buying teams and eliminating numerous internal documents. (Ref. 10, p. 23) "Another critical component in the Midrange success story is the electronic transmission mechanism for advance notices and solicitations, the genesis of the NASA Acquisition Internet Service (NAIS)." (Ref. 10, p. 23)

2. Overview

The NASA Acquisition Internet Service (NAIS) Homepage describes the NAIS as follows:

...a World Wide Web (WWW) service, from which industry has immediate access to current acquisition information over the Internet. The NAIS is a collection of on-line servers operated at each NASA field installation, and all are interconnected to ease the vendor's access to all NASA acquisitions. (Ref. 25)

NAIS provides some of the following features to its vendors:

- Advanced procurement notices of upcoming solicitations and contract awards
- The notices are formatted identically to those in the CBD
- Solicitations and their amendments
- Acquisition forecasts
- Sealed-bid abstracts
- Acquisition regulations (FAR, NASA FAR Supplement) (Ref. 25)

NAIS provides vendors access to current NASA acquisitions and competitive solicitations between \$25,000 and \$500,000. (Ref. 10, p. 22) When the NAIS was established in July 1994, NASA was looking to move away from reliance on the Commerce Business Daily (CBD), the U.S. Government's listing for contracting opportunities in the Federal Government for the commercial sector. (Ref 48, p. 58) In October 1994, a NASA procurement analyst, Thomas L. Deback, described the agency's idea as follows:

...the agency wants to short-circuit the legal requirement to post a synopsis of a solicitation, wait 15 days before releasing the details, then accept bids for another 30 days. 'Particularly when we're buying hardware off-the-shelf, we don't need 45 days. The offerors don't need 45 days. Why are we wasting all this time? (Ref 48, p. 58)

"The agency (NASA) was granted a waiver in the Federal Acquisition Streamlining Act of 1994 based on its ability to provide quicker access to acquisitions than the standard CBD publication process." (Ref 10, p. 24) With this authority, NASA then solicited mid-range contracts simultaneously on the CBD and electronically via their Internet on-line service for a period of six months. (Ref. 48, p. 58) During this time period, the space agency

watched responses from contractors to ensure ample competition existed for solicitations transmitted electronically via the Internet. (Ref. 48, p. 58) The Marshall Space Center, which had already successfully employed a pilot version of NAIS in early 1994 was the cornerstone for this effort. In the fall of 1994, both the Kennedy and Johnson Space Centers came on-line with Web-based servers. (Ref 48, p. 58) NASA continued developing NAIS and eventually ceased soliciting Mid-range requirements via the CBD in October 1995. The evolution of NAIS is provided in the next section.

3. Evolution

The history of NASA's Acquisition Internet Service is as follows:

- Jul 1994 - Initiated Internet World-Wide-Web (WWW) service at Marshall Space Flight Center for posting Midrange synopses and solicitations and general procurement information
- Dec 1994 - Established Federal Acquisition Jumpstation, "front door" to all federal acquisitions on the Internet
- Spring 1995 - Expanded WWW Service Agencywide
- Jun 1995 - Established Agencywide search capability
- Jul 1995 - Began posting all synopses and Midrange solicitations
- Aug 1995 - Began posting all simplified acquisition solicitations above \$25,000
- Sep 1995 - Began posting all other competitive solicitations. Now, all solicitations over \$25,000 are posted
- Oct 1995 - Discontinued advertising Midrange acquisitions up to \$500,000 in the Commerce Business Daily (Ref 17)

E. SUMMARY

Unlike DoD, the NASA Organization had not invested significant resources to

establish and implement an EC/EDI capability prior to President Clinton's Memorandum. Thus, NASA had no infrastructure upon which to conduct electronic commerce. In early 1994, a team of NASA procurement analysts investigated the available EC technologies in order to determine which one could best facilitate processing procurement transactions. The NASA team chose the Internet as their primary EC tool and a cornerstone to the Mid-range pilot program for procurements between \$25,000 and \$100,000. This chapter concludes the discussion of the thesis. The next chapter utilizes organizational theory and other influential factors to explain the different approaches used by each agency in implementing EC.

VIII. ANALYSIS AND APPLICATION OF ORGANIZATIONAL THEORY

A. INTRODUCTION

The primary research question is stated in two parts: (1) What can explain the different paths used by the DoD and NASA in implementing electronic commerce; and (2) how can such an analysis be used by the acquisition professional in implementing policy. The analysis in Chapter VIII will answer the first part of the question; conclusions and recommendations from Chapter IX will answer the latter part of the question. This chapter will focus upon two primary areas of analysis in explaining DoD's and NASA's implementation of EC within each of those organizations:

- Organizational Theory described in Chapter III
- Alternate influential factors discussed in Chapters IV, V, VI, and VII

This chapter's discussion will first apply components of Henry Mintzberg's organizational configurations to describe key personnel, factors, and behavior within each agency. Once the key components of each organization are identified, the organizational configurations described in Chapter III will be used to describe the DoD and NASA organizations and their implementations of EC.

B. MINTZBERG'S BASIC CHARACTERISTICS OF ORGANIZATIONS

Henry Mintzberg's theoretical framework discussed the six basic parts of organizations. (Ref. 14, p. 278) These elements of Mintzberg's organizational theory can be applied to describe key factors and personnel within both the DoD and NASA.

1. Department of Defense (DOD)

- Operating Core - DoD Activity Contracting Officers and Specialists
- Strategic Apex - Office of the Secretary of Defense
- Middle Line - Heads of Contracting Activities, Procurement Officials and Analysts at Contracting Activities
- Technostructure - Process Action Teams, Procurement Analysts, Information Systems Experts
- Support Staff - Legal Staff, etc.
- Ideology - DoD Mission to defend the National Interest

2. National Aeronautics and Space Administration (NASA)

- Operating Core - NASA Center Procurement Office Contracting Officers and Specialists; Procurement Analysts at NASA Centers
- Strategic Apex - Administrator, NASA; Associate Administrator for Procurement
- Middle Line - NASA Center Procurement Officers, Director of NASA Centers
- Technostructure - NASA Team to Analyze Electronic Commerce Media, Procurement Analysts at Headquarters
- Support Staff - Legal Staff, etc.
- Ideology - NASA Mission to operate aeronautical and space vehicles in exploration of space

C. MINTZBERG'S SITUATIONAL FACTORS

Henry Mintzberg's also present "situational factors" as key elements of an organization's complexity. To review, these factors are as follows:

- Age and Size
- Technical System

- Environment
- Power

Several hypotheses accompanied explanation of each situational factor, describing basic tendencies of organizations. Through the application of Mintzberg's hypotheses, a rational model emerges to explain why DoD and NASA differed in implementing EC.

1. Department of Defense (DOD)

a. Age and Size

The DoD is chronologically older and also larger than NASA. The Navy and Army components both were established over 200 years ago, and the current DoD structure has existed since 1947. In addition, the DoD employs over 2.2 million personnel; NASA employs 22,000. Based upon these facts, Mintzberg's hypotheses suggest that the DoD will exhibit the following behavior.

- More formalized behavior, regulation, and control systems
- More elaborate structure and specialized tasks
- More developed administrative structure
- Such organizations tend to repeat their behavior (Ref. 14, p. 293)

In implementing President Clinton's Executive Memorandum, the research suggests that DoD has exhibited these behaviors. The Office of the Secretary of Defense (OSD) established both a DoD ECIC PAT and EC Office to control and monitor the implementation of the DoD EC/EDI infrastructure. The Under Secretary of Defense (Acquisition and Technology) (USD)(A&T) directed the implementation of the PAT's recommendations and issued formal policy to ensure only "standardized systems" were implemented.

b. Technical System

Mintzberg hypothesizes that the more regulatory and complex the technical system, the more bureaucratic the structure of the operating core. (Ref. 14, p. 294) The DoD's technical system is the Defense Information Infrastructure and the DoD EC/EDI infrastructure, a highly complex, regulated and controlled system. The DoD has tightly controlled the implementation of the EC/EDI infrastructure since the PAT Report was issued, designating the Defense Information Systems Agency (DISA) as the executive agent to implement the DoD EC/EDI infrastructure.

c. Environment

Mintzberg's hypotheses state that the more complex the environment, the more decentralized the structure. Conversely, hostility in an organization's environment will drive an organization to centralize, employing tight mechanisms to respond to the crises. (Ref. 14, p. 295) The environment can be considered threatening or hostile because of the information technology explosion, political pressure applied by the Clinton Administration to implement EC, and the accelerated implementation schedule mandated by the Presidential Memorandum.

The dynamic nature and exploitation of information technology by DoD in the 1990's created a complex situation of independent initiatives intended to take advantage of new technology and improve business practices. The OSD formed the DoD EC/EDI Office and designated DISA to develop EC/EDI technology. The accelerated schedule set forth in President Clinton's Memorandum created pressure for Federal agencies to not only implement EC, but do it quickly. In addressing this situation, DoD centralized its efforts.

d. Power

The fourth situational factor used to predict DoD behavior is power. The theory suggests that the power needs of the members tend to generate centralized structures. (Ref. 14, p. 296) Within DoD, a power struggle exists in the form of rivalry between the Services and overlapping missions. In DoD's organizational structure, each Service and OSD have essentially equal power. All organizations report to the Secretary of Defense. In order to maintain their power base, each of these Services centralizes its authority at the top and, in turn, are centrally managed by OSD.

2. National Aeronautics and Space Administration (NASA)

The situational factors theorized by Mintzberg when applied to NASA present different behavior patterns. Generally, NASA displayed behavior opposite to that of DoD. The hypotheses used to describe DoD are identical to those describing NASA.

a. Age and Size

Unlike DoD, NASA is a relatively younger and smaller organization. The NASA organization was established less than forty years ago and is comprised of only 22,000 employees, as compared to the 2.2 million person DoD workforce. NASA exhibited behavior divergent to DoD's. Although NASA is a public organization like DoD, and has an established structure (see page 61), its behavior is not as formalized as DoD's.

In implementing EC, NASA did not formalize its behavior, specialize tasks, nor did it establish sophisticated administrative mechanisms. NASA instead allowed its Centers to investigate EC solutions, and then report findings to headquarters. No centralized office was established to control the implementation or develop an infrastructure. The

NASA team instead chose to employ an existing infrastructure, the Internet, as the system upon which to develop its EC capability.

b. Technical System

There was no sophisticated technical system employed by officials at NASA Headquarters and the NASA Centers. Thus, an elaborate administrative and bureaucratic structure was not necessary.

c. Environment

The NASA organization faced the identical complex information technology environment that DoD encountered, but reacted much differently. The Associate Administrator for Procurement, Ms. Deidre Lee pushed the decision-making down to the level of the Centers to develop a plan and system by which to implement the Presidential EC mandate. NASA did not use tight mechanisms for control that DoD employed to respond to the accelerated implementation schedule.

d. Power

NASA Headquarters did not tightly control all the phases of implementation, but instead coordinated the individual efforts of each Center to develop a system suitable to the meet the needs of all the NASA Centers. Thus, the Marshall Space Center piloted the NASA Acquisition Internet Service (NAIS), which became the model for all NASA Centers. The solution was the result of a decentralized structure.

D. DOD: A MACHINE ORGANIZATION

In addition to describing DoD's organizational behavior by applying situational factors, Mintzberg theorizes organizations have distinctive configurations. Chapter III discusses characteristics of both the Machine Organization and Innovative Organization. This discussion theorizes the following:

- The DoD is a Machine Organization
- Because the DoD is a Machine Organization, it chose to implement President Clinton's Executive Memorandum using a mechanistic, highly structured approach.

Chapter III identified four key aspects of organizational configuration:

- Basic structure
- Conditions
- Strategic Apex
- Strategy Formulation

1. Basic Structure

According to Mintzberg, the chain-of-command is the key to operating the machine organization. The structure is rigid, with little room for flexibility. The middle-line hierarchy and their tasking is clearly defined. Middle-line managers resolve conflict in the operating core, work with analysts to incorporate standards to the operating core, and support vertical flows of information up and down the hierarchy. The technostructure possesses significant informal authority. (Ref. 15, p. 635)

DoD is a formally structured organization, where the chain-of-command is vital to administration and operation in order to fulfill the mission as stated in Chapter VI. The DoD's mission is to "defend the national interest through military force ... and use military

forces in certain specific situations to address humanitarian crises” (Ref. 3) The chain-of-command simplifies and facilitates military leaders’ ability to direct the Armed Forces to accomplish the Defense mission.

The electronic commerce implementation appeared to be no different. The overall authority for EC implementation rests with the DoD EC/EDI Office and DISA, who direct the implementation of the EC/EDI infrastructure. The middle-line managers’ roles in DISA and the Services are to implement the infrastructure, solving problems with implementation at their level.

2. Conditions

Typically, large and mature organizations use a machine configuration for two reasons: (1) they can take advantage of large volumes of work with standardized processes and; (2) they are old enough to have established standards. (Ref. 15, p. 638) The DoD, as administered by OSD is a large, mature organization, continually looking for ways to standardize processes across the Armed Forces. The Defense Logistics Agency, Defense Information Systems Agency, and the Defense Information Infrastructure are some of the results of DoD’s pursuit to standardize. In implementing EC, DoD is attempting to use established standards and guidelines within the Services and standardize those for all contracting activities utilizing the DoD EC/EDI infrastructure.

Secondly, the machine configuration applies to public sector organizations, which must be accountable to the public. Within this particular configuration, the organization develops a mechanism to ensure that public trust. (Ref. 15, p. 638) According to Mintzberg, a tendency of machine organizations is to proliferate regulations. DoD

manifested this tendency by issuing strict guidelines for agencies to follow in order to have full capability of the DoD EC/EDI infrastructure.

3. Role of the Strategic Apex

According to Mintzberg, managers at the strategic apex are the only generalists in the organization, who aim to maximize efficiency and minimize conflict at the middle-line and operating core. Also, these managers exercise significant formal power. In implementing EC within the DoD, the strategic apex resides at the OSD level with Dr. Paul Kaminski, USD (A&T); Ms. Colleen Preston, DUSD (AR); and Ms. Dee Smith, the Director of the DoD EC/EDI Office. These appointed officials control the EC implementation within DoD and mandate policy.

4. Strategy Formulation

Because managers at the strategic apex in the Machine Organization are the only generalists, strategy is naturally formed at the top of the organizational hierarchy. Once the strategy is formed, implementation of that strategy flows down the organization to the middle-line and finally the operating core. (Ref. 15 , p. 642) To formalize an EC strategy within DoD, OSD directed the formation of the DoD ECIC PAT. The PAT developed an EC strategy, (1) promoting the use of EDI; and (2) capitalization of existing hardware and software systems, promulgating it in the PAT Report 20 December 1993. The Memorandum from USD (A&T), Dr. John Deutch, initiated the implementation of that strategy.

E. NASA: AN INNOVATIVE ORGANIZATION

This part of the analysis theorizes the following:

- NASA is an Innovative Organization
- Because NASA is an Innovative Organization, it chose to implement President Clinton's Executive Memorandum in a flexible, adaptive manner

The discussion of NASA will focus upon the same four aspects of organizations used to describe the DoD organization.

1. Basic Structure

While the NASA organization is more formally structured than some innovative organizations in industry, its structure best resembles the innovative configuration. The innovative organization's structure is based upon a few principles: job specialization based upon expertise, little formalization of behavior, considerable decentralization, and flexibility. Also, in order for the innovative organization to operate, information flow and decision-making are as informal as possible. (Ref. 15, p. 680)

The NASA organization is relatively flat, with few levels of authority. Expertise within NASA is divided between ten NASA Centers and focused in four functional areas: Mission to Planet Earth, Space Flight, Aeronautics, and Space Science. The structure is decentralized to provide flexibility to each NASA Center in conducting operations. For procurement matters, the procurement officers of each NASA Center can directly communicate with the Associate Administrator for Procurement, bypassing the director of the NASA Center altogether.

2. Conditions

Mintzberg states that the innovative configuration is found in both dynamic and complex environments, and specifically mentions space agencies in discussing conditions for innovative organizations on page 27. (Ref. 15, p. 685)

NASA was established in 1958, without any bureaucratic structure, in order to fulfill highly technical and complex missions such as development and operation of aeronautical and space vehicles, and exploration of space with manned and unmanned vehicles. In order to fulfill these highly technical and complex missions, Mintzberg says organizations such as NASA develop an innovative configuration. Mintzberg adds that these new and youthful organizations tend to bureaucratize as they age. In order to survive, they develop administrative adhocracies. NASA has bureaucratized since its developmental years, but still maintains an innovative configuration in fulfilling its mission within a complex, dynamic environment.

3. Role of the Strategic Apex

The role of the manager at the strategic apex of the innovative organization is much different than that of the manager in a machine bureaucracy. Instead of promulgating policy and controlling, the top manager of the innovative organization provides vision and allows middle-line managers to execute. (Ref. 15, p. 684) This manager predominantly spends time coordinating and monitoring multiple projects. Because expertise defines power and is spread throughout the organization, the manager at the strategic apex must be a master in conflict resolution and persuasion.

Such was the case in NASA where the Associate Administrator for Procurement set broad policy that NASA Centers implement the October 1993 Presidential Memorandum. As a result, Goddard Space Flight Center (Goddard) developed EDI pilot programs to fulfill the requirements of the memorandum, while the procurement team investigated alternate electronic business media to determine which best fit NASA's

objectives. What resulted was Marshall Space Flight Center's (Marshall) Internet pilot program which eventually evolved into the NASA Acquisition Internet Service (NAIS).

4. Strategy Formulation

Unlike the machine bureaucracy, strategy is not formed in one place, but rather by specific actions in many places. (Ref. 15, p. 687) NASA's strategy to use the Internet as an EC tool emerged because of the Marshall's pilot program. As Marshall's pilot developed and evolved, managers at the strategic apex at NASA Headquarters began to support the Internet as an EC solution.

F. VIABILITY OF ORGANIZATIONAL THEORY

The analysis thus far has interpreted facts from both the DoD's and NASA's cases, using Mintzberg's organizational configuration models. From this analysis, it can be determined that DoD demonstrates characteristics of a machine organization, and NASA resembles an innovative organization. However, the answer to the primary research question may not be intuitively obvious. The fact that organizational theory does not always provide a direct "cause and effect" link can cause some difficulty in this type of analysis.

In order to completely answer the question, it is necessary to review the purpose of organizational theory in general. Chapter III describes organizational theory as an "approach that seeks to describe, compare, and evaluate organizations, and provide a theoretical framework for understanding and predicting organizational outcomes." (Ref. 13, pp.3-4) The key theme to extract from this definition is that organization theory "provides a theoretical framework for understanding and predicting outcomes." Some of the aspects of Mintzberg's organizational theory do not always definitively describe the

behaviors of organizations, but provide an analytical framework to understand organizational tendencies. The analysis of situational factors provides insight into understanding behavioral tendencies of organizations in response to internal and external factors. In this vein, organizational theory is a viable means by which to describe the EC implementation paths of DoD and NASA.

Because DoD can be described as a machine organization, it implemented EC in a structured, restrictive, controlled, regulatory manner, resulting in the DoD EC/EDI Infrastructure. Machine bureaucracies such as DoD strive to maximize efficiency. The DISA's incorporation of the DoD EC/EDI Infrastructure into the DII exemplifies this objective.

Decisions were made at the top, and implementation flowed down the chain-of-command. Thus, OSD formed the PAT which issued its report, promoting EDI and capitalization of existing equipment. The strategic apex at USD (A&T) directed DUSD (AR) to execute the implementation plan. The DISA and DoD contracting activities then implemented a standardized EC/EDI plan in a machine-like fashion, without input from the operating core.

Conversely, because NASA is an innovative organization, the strategic apex at NASA Headquarters need only provide broad guidance to implement the Presidential Memorandum. The Associate Administrator granted procurement officers at the NASA Centers the latitude and authority to pursue imaginative solutions to implement EC. As a result, Marshall Space Flight Center developed an Internet-based solution which evolved into the NAIS.

G. ALTERNATE INFLUENTIAL FACTORS

While organizational theory is one way to describe the different paths of EC implementation used by DoD and NASA, there are other factors that may have influenced each organization to pursue their implementation path. It is critical to understand that one of these factors, in itself, cannot exclusively explain actions and decisions within each organization.

1. Timing of EC Implementation and the Emergence of Internet

A simple timeline from 1991 to 1995 provides the basis for providing a historical context to analyze the effect of timing upon implementation of EC policy.

1990 - DMRD 941 directed EC/EDI use in DoD

1991 - World Wide Web is released

1993 - The White House comes on-line with E-Mail

WWW Browser technology encourages business and media to take notice of Internet

(Feb) - CIM Conference highlighting DoD EC/EDI Projects

(Jul) - DoD PAT formed to assess DoD EC Capability

(Sep) - National Performance Review Report

(Oct) - President Clinton's Memorandum
DISA renamed from DCA, responsible for EC/EDI Infrastructure

(Dec) - DoD PAT Report, recommending EDI via EC/EDI Infrastructure

1994 - Mosaic browser technology makes Internet more user-friendly

(Jan) - USD (A&T) Approves DoD PAT Report, directs its execution
Federal ECAT formed to implement EC in Federal Government

(Feb) - DUSD (AR) establishes the DoD EC Office

(Apr) - USD (A&T) issues memorandum regarding non-standard EC/EDI

(Spring) - Goddard (NASA) establishes pilot EDI program
NASA EC Team decides upon the Internet

(July) - Initiated WWW Service at Marshall Space Center

1995 - Traditional online systems (Compuserve, American Online) begin to
provide Internet access

(Spring) - Expanded WWW Service Agencywide

This time line demonstrates several key points:

- When the issue of EC in the Federal Government was in its infancy, the Internet was not widely used in the commercial sector. Thus, the members of the Federal Electronic Commerce Acquisition Team (Federal ECAT) did not incorporate its potential into the Government's long and short-term EC plans.
- EC/EDI was a DoD initiative in 1990 in DMRD before the World Wide Web was released. Based upon that DMRD, many activities within the Services initiated their own EDI programs. By the time the Presidential Memorandum was issued, DoD activities had been conducting EC via EDI for several years.
- Unlike DoD, NASA did not initiate an EDI program until the Spring of 1994. They initiated their program in response to the Presidential Memorandum in October 1993.
- NASA seemed to follow the emergence of the Internet. In 1994, when Internet technology had progressed to make it easier to use, NASA took notice. The NASA EC Team saw the user-friendly Internet as an option to Electronic Bulletin Boards and EDI.

In summary, NASA adapted to its external environment and information technology development in pursuing the Internet. DoD, on the other hand, did not adapt to the emerging technology of the Internet, focusing instead on an established technology in EDI which it continued to develop.

2. Infrastructure Differences

Understanding the historical context in which the Internet emerged and Federal Government EC policy was implemented describes why DoD and NASA initially pursued their respective implementation paths. However, it cannot fully explain why the organizations have continued down different paths. By examining the differences in infrastructure, it becomes more evident why DoD is pursuing an EC/EDI solution and NASA is following through with an Internet-based solution.

a. DOD

The DoD PAT Report recommended that DoD capitalize existing systems, hardware, and software in order to improve upon them. In 1993, The Assistant Secretary of Defense (SECDEF) (C3I), Mr. Emmitt Paige designated DISA as the executive agent responsible for establishing the DoD EC/EDI Infrastructure. In 1995, Mr. Paige stated that DoD was committed to implementing EC/EDI using DISA's Defense Information Infrastructure. Although the Internet technology is readily available as an alternative, it is unlikely DoD will abandon its EC/EDI infrastructure given the significant investment in resources to develop the architecture.

b. NASA

The NASA, on the other hand, did not invest in infrastructure. Because NASA did not pursue EDI as early as DoD, it had no need to establish an architecture similar to that of DoD. NASA, like many other Federal agencies, was constrained by a dwindling budget. Since the Internet is a Global network of networks, no investment to build an infrastructure was needed. The Internet provided the EC solution NASA needed, an easy-to-use, inexpensive system that required minimal investment to implement.

3. Procurement Environment

Both agencies tailored their EC approaches to satisfy the majority of their procurements.

a. DOD

The DoD PAT Report analyzed the procurement environment, using FY 1992 data. The PAT determined 98 percent of DoD's transactions fell below the \$25,000 threshold. These procurements tended to be simple, high-volume procurements. Based upon that finding, the DoD PAT concluded it made sense to use the EC/EDI infrastructure to process such transactions even though no replication of similar usage in industry was demonstrated.

b. NASA

NASA did not completely dismiss using EDI as an EC tool to process some of their more simple, high-volume transactions. However, the NASA EC Team determined most of NASA's acquisitions were not simple transactions, but rather were complex procurements, requiring elaborate solicitation descriptions for equipment or services. According to the NASA EC Team, it was counterproductive to format such complex transactions into a usable EDI format.

NASA procurement analysts determined that eighty percent of NASA's contract actions fell between the \$25,000 to \$500,000 range. NASA established the Mid-Range program to simplify procedures to process such transactions. As part of the Mid-Range program, the NASA Acquisition Internet Service evolved.

4. Interpretation of Language

The language within both President Clinton's Executive Memorandum and the Federal Acquisition Streamlining Act (FASA) provided great latitude for interpretation, allowing agencies to implement network architectures to meet their particular needs and missions. The objectives in the Clinton Memorandum provide broad guidance. For example, several objectives are described as the ability to "exchange procurement information" or "ensure that potential suppliers are provided simplified access".

Amplification on what to use to exchange information or what is meant by simplified access is not provided. This language most likely is written to allow for broad interpretation to provide agencies such as DoD and NASA flexibility to implement electronic commerce. However, the intent of the Memorandum may be confused in interpretation.

Language within the FASA also allows for broad interpretation. For example, the term "FACNET" is never defined. Therefore, it is possible for DoD and NASA to have completely unique definitions of the term "FACNET". Additionally, the term "architecture" is defined broadly as "the conceptual framework that uses commercial hardware and software..." allowing again for broad interpretation.

H. SUMMARY

Chapter VIII answered the first part of the thesis question in explaining why DoD pursued and EDI infrastructure while NASA pursued an Internet-based EC solution.

First, the analysis used organization theory to first describe the organizational configuration of each organization. DoD is a Machine Organization. NASA is an Innovative Organization. Once the configurations were established, the discussion in this

chapter explained how those configurations could be used to predict the organizational behavior of each agency and explain the EC implementations employed by DoD and NASA.

Second, this chapter investigated alternate explanations for the two agencies using unique approaches in implementing the President's 1993 EC Memorandum.

The next and final chapter, Chapter IX (Conclusions and Recommendations) will answer the latter part of the thesis question and provide for future areas of research.

IX. CONCLUSIONS AND RECOMMENDATIONS

A. SUMMARY AND CONCLUSIONS

This chapter answers the latter half of the original research question, providing conclusions and recommendations based upon the analysis in Chapter VIII.

Chapter I describes the dynamic, volatile environment in which the acquisition professional works. Realities such as declining budgets and resources, and the explosion of information technology require workers in the acquisition force to improve both their efficiency and effectiveness. By intelligently harnessing the power of information technology, such as EDI and the Internet, acquisition professionals within Federal agencies can improve their efficiency. In order to increase their effectiveness, they must think more analytically, increasing their professional body of knowledge to better use dwindling resources.

1. Value of Organizational Theory

Organizational theory is one analytical tool available to acquisition professionals. The organizational theory described in Chapter III and used in analysis of DoD and NASA suggested that DoD is a machine organization and NASA is an innovative organization. Based upon that premise, the analysis in Chapter VIII theorizes that the organizational configurations were influential in determining how each agency implemented electronic commerce.

However, the analysis also presents alternate explanations, demonstrating the difficulty in determining one definitive reason why organizations behave the way they do. Organizational theoretical models do not provide a fool-proof method to describe and

analyze organizational behavior. Organizational theory instead provides a policy-maker a framework for predicting an organization's behavior that may influence or result from implementation of policy. If a policy maker first understands the organizational configuration, then more intelligent strategy implementation may follow.

The case study of EC implementation within DoD and NASA provides the acquisition professional salient examples of internal and external factors that can govern an organization's implementation of policy. For DoD, the massive investment in the Defense Information Infrastructure and EC/EDI infrastructure drove DoD EC implementation. For NASA, the Mid-Range program and continuing evolution of Internet technology were the key influential factors.

2. Implementation of Electronic Commerce

a. DOD

Because, as the research suggests, DoD functions more like a machine organization, OSD and DISA adopted and implemented information technology in a structured, controlled manner, rather than adapting technology to meet their need. Organizational theory suggests that machine organizations aim to maximize efficiency of operations at the working level, doing so by formulating strategy at the top, followed by implementation. In utilizing existing infrastructure and incorporating the EC/EDI architecture in the Defense Information Infrastructure, OSD and DISA maximized the efficiency of information technology resources. In its quest for efficiency, however, DoD and its EC/EDI infrastructure may not meet the requirements of DoD contracting activities and contractors.

b. NASA

The NASA's innovative configuration enabled the agency to adapt to the available technology in order to meet the requirements of NASA Center procurement offices and vendors. The NASA developed its Internet-based EDI program to meet the requirement of processing simple, high-volume procurements. By doing so, NASA also fulfilled the requirements and met the initial milestones of the Presidential Memorandum.

The NASA, however, realized that while EDI provided a solution to process such procurements, the majority of their procurements were complex acquisitions for special equipment and services that required elaborate solicitations. The specified format for EDI could not effectively process such procurements. Thus, NASA procurement analysts determined the Internet possessed a greater capability to electronically, exchange more complex solicitations and proposals.

3. Electronic Commerce is Here To Stay

Electronic commerce is one way industry is improving business practices. The Government must also use electronic commerce to improve its business practices. Both industry and the Government are enjoying success in using electronic means to streamline processes, through EDI, Bulletin Boards, E-Mail, and the Internet. EDI has been used for over twenty years in numerous industries to reduce transaction costs and time, streamlining business processes. As information technology continues to evolve, so must the Federal Government's capacity to improve its EC technologies and systems. DoD must continue to build upon its original infrastructure to improve its capability to meet the objectives of the Presidential Memorandum.

4. The Internet is Changing Business and Government

NASA chose to follow business, and business continues to lead them to the Internet. Companies such as General Electric are implementing Internet-based purchasing systems. The potential of the Internet is being realized within the Federal Government and DoD, as well. The General Services Administration and Army Medical Command have streamlined procurement processes via the Internet. Although OSD does not yet endorse use of the Internet in its overall EC/EDI strategy, both the Navy and Air Force are pursuing individual Internet initiatives.

B. RECOMMENDATIONS

1. Tailor EC To Meet Agency Need

While EDI is successful in exchanging data between computers to process routine, simple transactions, the technology does not apply when processing more complex, involved transactions. EDI was designed by industry to meet the needs of customers on a “one-to-one” basis. The DoD EC/EDI system attempts to conduct EDI on a “one-to-many” basis.

NASA realized this in 1994 and began pursuing a solution that could handle more elaborate solicitations and proposals, the Internet. NASA also demonstrated that EDI can be accomplished via the Internet. Acquisition and EC must address the customer’s needs. Procurement organizations should tailor the EC system to maximize the ability to meet the agency’s need.

2. Government and DOD Should Increase Use of the Internet

Technology is evolving to improve the security of transactions over the Internet.

Chapter IV described the efforts of companies in the private sector who are developing software products, firewall solutions, and security networks to increase security measures. NASA is methodically developing its NAIS in order to incorporate some of the latest information security technology into its system. The Government should continue to pursue all its ongoing Internet initiatives. Finally, the DoD EC Office needs to acknowledge the potential of the Internet and its potential to further streamline procurement.

C. ANSWERS TO RESEARCH QUESTIONS

The primary objective of this research was to examine the question:

What aspects of organization theory and other influential factors can explain the different paths of implementation used by the DoD and NASA in complying with the Presidential Memorandum on electronic commerce, and how can such an analysis assist the acquisition professional in implementing policy within his or her organization?

To answer the primary research question, the following subsidiary research questions were asked:

- 1. What was the original intent of President Clinton's Electronic Commerce Memorandum, and how has electronic commerce policy evolved since the Presidential Memorandum was issued?**

The original intent of President Clinton's Electronic Commerce Memorandum was to "simplify and streamline the purchasing process in order to promote customer service and cost effectiveness." The President's Memorandum issued on 26 October 1993 put the recommendations of the National Performance Review in motion to establish an electronic commerce capability within the Federal Government. The evolution of electronic commerce policy following the Clinton Memorandum is discussed in Chapter V.

2. How have DoD and NASA implemented their respective network architectures to satisfy the President's Memorandum?

Chapter VI describes how DoD implemented the DoD EC/EDI Infrastructure using hardware and software from existing EC systems used by the Navy, Army, Air Force, and Marine Corps. Chapter VII describes how NASA came to implement an Internet-based procurement service, the NASA Acquisition Internet Service (NAIS).

3. How does organization theory describe the organizational configurations of DoD and NASA?

The organizational theory of Henry Mintzberg is presented in Chapter III. Mintzberg provides models of the Machine Organization and the Innovative Organization. These models consist of four major parts:

- Structure
- Conditions
- Roles of the Strategic Apex
- Strategy Formulation

The models are then applied to analyze DoD's and NASA's organizational behavior in Chapters VI and Chapters VII, respectively. The basic conclusion: DoD is a Machine Organization; NASA is an Innovative Organization. The configurations provide a framework to predict the organizational behavior of each agency.

4. What were the influential factors and documents that guided the policy and implementation for the decision makers of each agency?

The National Performance Review and Presidential Memorandum initiated the implementation of electronic commerce within the Federal Government. The DoD had initiated its EC/EDI efforts prior to both of those documents issued in the fall of 1993. DoD's first direction to use EDI was a Deputy SECDEF Memo issued in 1988. The DoD EC in Contracting Process Action Team promulgated a report in January 1994 which provided DoD's implementation plan. Additionally, OSD established a DoD EC Office to coordinate the EC effort.

NASA was guided by the Clinton Memorandum and the recommendations provided by an ad-hoc team of NASA procurement analysts. This team decided the Internet was the preferred method to conduct EC. Additionally, the Mid-Range procurement program and the continuing evolution of the Internet continue to guide NASA's EC efforts.

5. What is the effect of new technology, such as the Internet, on an organization as it seeks to implement a Presidential memorandum?

The primary effect is the organization's ability to adapt to technology or to adopt technology.

For DoD, the emergence of the Internet has not had a pronounced effect on how they are implementing the Clinton Memorandum, because DoD had already adopted EDI technology and invested massive resources to build the DII and EC/EDI Infrastructure.

The NASA, however, has adapted to the emergence of the Internet. Its Internet-based NAIS has been a driving force behind the success of its EC program. EDI and Electronic Bulletin Boards were determined to be too clumsy and costly. The Internet

provided the technology necessary to process the complex, elaborate solicitations that comprise a great majority of NASA procurements.

D. RECOMMENDATIONS FOR FURTHER RESEARCH

In conducting research and interviewing personnel, several areas for further research became evident. These areas include:

- What are the current Internet initiatives within each of the Services? Could any of these initiatives be used as a model by which to develop a standardized system such as NASA's Acquisition Internet Service?
- Discuss information security. What are the primary issues with security with FACNET and the Internet? Should transaction security even really be an issue with procurements under the Simplified Acquisition Threshold?
- Discuss the Standard Procurement System. (SPS) What are its components, and will it provide a "single face to industry?" How will the Internet be incorporated into SPS, if at all?
- Discuss the "single face to industry" concept. Although a cornerstone of FASA, is it a realistic notion when implementing electronic commerce?
- Provide an update on FACNET implementation. Many obstacles to fully implementing FACNET have been noted in recent 1996 GAO and DODIG Reports. Can DoD effectively meet the mandates of FASA, while providing outstanding customer service? How will the DoD EC/EDI Infrastructure keep up with technology?

APPENDIX

LIST OF ABBREVIATIONS

ANSI	American National Standards Institute
ARPA	Advanced Research Projects Agency
ASO	Naval Aviation Supply Office
BPA	Blanket Purchase Agreement
BRAC	Base Realignment and Closure
BUR	Bottom-Up-Review
C3I	Command, Control, Communications, and Intelligence
CBD	Commerce Business Daily
CIM	Corporate Information Management
DCA	Defense Communications Agency
DII	Defense Information Infrastructure
DISA	Defense Information Systems Agency
DLA	Defense Logistics Agency
DMRD	Defense Management Review Decision
DoD	Department of Defense
DUSD (AR)	Deputy Under Secretary (Acquisition Reform)
EASE	Electronic Assisted Solicitation Exchange
EBB	Electronic Bulletin Boards
EC	Electronic Commerce

EC/EDI	Electronic Commerce/Electronic Data Interchange
ECAT	Federal Electronic Commerce Acquisition Team
ECIC PAT	Electronic Commerce in Contracting Process Action Team
ECPN	Electronic Commerce Processing Node
EDI	Electronic Data Interchange
EFT	Electronic Funds Transfer
E-mail	Electronic Mail
FAC	Federal Acquisition Circular
FACNET	Federal Acquisition Computer Network
FAR	Federal Acquisition Regulation
FASA	Federal Acquisition Streamlining Act
GAO	General Accounting Office
GATEC	Government Acquisition Through Electronic Commerce
GE	General Electric
GSA	General Services Administration
ITIMP	Integrated Technical Item Management and Procurement System
NAIS	NASA Acquisition Internet Service
NASA	National Aeronautics and Space Administration
NII	National Information Infrastructure
NPR	National Performance Review
NREN	National Research and Educational Network
NSF	National Science Foundation

NSFNET	National Science Foundation Network
OFPP	Office of Federal Procurement Policy
OSD	Office of the Secretary of Defense
PAT	Process Action Team
PMC	President's Management Council
POPS	Paperless Order Placement System
SAACONS	Standard Army Automated Contracting System
SAT	Simplified Acquisition Threshold
SECDEF	Secretary of Defense
SPS	Standard Procurement System
TDCC	Transportation Data Coordinating Committee
USD (A&T)	Under Secretary of Defense (Acquisition and Technology)
VA	Veterans Administration
VAN	Value-Added Network
WWW	World Wide Web

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Naval Postgraduate School
Monterey, California 93943-5000

6. Dr. David V. Lamm (Code SM/Lt) 5
Naval Postgraduate School
Monterey, California 93943-5103

7. Mr. Elliot Branch 1
Executive Director, Acquisition and Business Management
2211 South Clark Place
Arlington, Virginia 22244-5104

8. Mr. Ken Stepka 1
NASA Headquarters
Mailstop - HC
Washington, DC 20546-3082

9. Mr. James Bradford 1
NASA Headquarters
Mailstop - HC
Washington, DC 20546-3082

10. Capt. (Retired) Myron P. Gray 1
5257 Lightfoot Path
Columbia, Maryland 21044
11. Capt. (Retired) Robert W. Boyce 1
1659 Potter Drive
Pottstown, Pennsylvania 19464
12. LT Rodney A. Gray, SC, USN 2
Defense Contract Management Command Boston
495 Summer St.
Boston, Massachusetts 02210-2184